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THE NEARCTIC SPECIES OF GASTERUPTIIDAE  
(HYMENOPTERA)

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THE Hymenoptera treated herein have previously been included in the family Evaniidae or in the separate families Gasteruptiidae<sup>1</sup> and Aulacidae. It is now generally agreed that they have little in common with the Evaniidae and that the main character by which they were formerly associated, the high attachment of the abdomen to the thorax, has been acquired independently in the two groups. Subsequent to their taxonomic separation from the Evaniidae, these insects were segregated as the families Aulacidae and Gasteruptiidae. Close similarity in fundamental structure suggests that they are better treated as two subfamilies of a single family. Comparing members of the well-known genus *Gasteruption* with the Aulacinae, one finds striking differences in body form and in venation, but there are also many points of structural agreement. When the primitive, less well known Gasteruptiinae of the Australian Region (*Hyptiogaster*, etc.) are compared with the Aulacinae, many of the differences of body form and venation apparent when only *Gasteruption* is used disappear. Those remaining are tabulated in the key to subfamilies below. Structural peculiarities that run through the whole family in its broader limitation, but that are often overlooked, are the partial to complete fusion of the first two abdominal tergites and the fact that the antenna has 13 segments in the male and 14 in the female. At present the family

<sup>1</sup> This name is usually spelled Gasteruptionidae, but the stem of the type generic name (*Gasteruption*) is Gasterupti-, which with the addition of -idae results in Gasteruptiidae.

is placed in the Ichneumonoidea, but the only family of the Ichneumonoidea with which it shows definite relation is the Megalyridae. And the real affinities of the Megalyridae and Gasteruptiidae are unproved.

The Gasteruptiidae are readily separable from all other Hymenoptera by a combination of three characters: 1, Abdomen attached to the thorax (alitrunk) high, far above the attachment of the hind coxae; 2, hind wing without closed cells or with a single closed cell; 3, first abdominal segment not set off from the rest of the abdomen by a conspicuous articulation. Of these, the first character is shared only with the Evaniidae and a few Braconidae (especially *Capitonus*) and Ichneumonidae (most Labenini). The second character differentiates the Gasteruptiidae from the Braconidae and Ichneumonidae, and the third differentiates them from the Evaniidae.

Previous literature of importance on the Nearctic Gasteruptiidae includes a revision by Bradley (Trans. Amer. Ent. Soc., vol. 34, pp. 107-128, 1908), a compilation of the world literature by Kieffer (Das Tierreich, vol. 30, pp. 189-410, 1912), and a world catalog by Hedicke (Hymenopterorum catalogus, pars 10, Aulacinae, and pars 11, Gasteruptiinae, 1939). In this revision only original descriptions are given in the species bibliographies. Most of the rest of the Nearctic literature may be traced by use of Hedicke's catalog.

I have studied the types at Cambridge, Quebec, Ithaca, Philadelphia, Claremont, Washington, Lawrence, and Stockholm. J. F. Perkins has compared specimens for me with the Nearctic types at London and at Oxford University. Application of the rest of the names has been determined from literature.

The Nearctic specimens of the more important collections have been studied. In listing the location of specimens, institutional collections are indicated in parentheses by the name of the city in which the institution is located, and private collections by the name of the owner in parentheses. To the various curators I extend sincere thanks for making the material available to me.

#### KEY TO THE SUBFAMILIES OF GASTERUPTIIDAE

- Forewing with second recurrent and two or three intercubital veins present (fig. 15, *a-i*), not folded upon itself when at rest; hind tibia sublinear, not clavately swollen; hind coxa of female internally usually with a vertical or oblique channel; maxilla and labium not anthophilous; parasites of wood-boring Coleoptera and Symphyta.....**Aulacinae**
- Forewing without second recurrent and with only one intercubital vein (fig. 15, *j, k*) or a faint second intercubital present in some exotic species, folded lengthwise upon itself when at rest; hind tibia more or less swollen apically, clavate; hind coxa of female internally without a channel; maxilla and labium anthophilous; parasites of Sphecoidea and Apoidea nesting in wood or twigs.  
**Gasteruptiinae**

## Subfamily AULACINAE

This is doubtless the primitive group of the family, and within it is evidence of the origin of the peculiar family character of the high attachment of the abdomen to the thorax: Parasitic Hymenoptera with long ovipositors have evolved several methods of bracing the ovipositor against bending while it is used for drilling. One of these is to hold the ovipositor between the hind coxae, and in the groups using this method the inner surfaces of the female hind coxae are often modified to perform this function better. The usual abdominal articulation is immediately between and slightly beyond the attachments of the hind coxae, where it would interfere with the use of the hind coxae for holding the ovipositor. In the groups using the hind coxae thus, there is a tendency for the abdominal articulation to move upward and for the coxal articulations to move backward until they are directly below or slightly beyond that of the abdomen. In the Aulacinae and in a few braconids (*Capitonius*) and ichneumonids (*Certonotus*, *Labena*, and *Apechoneura*) the modification of both the inner surface of the female hind coxa and of the position of the abdominal articulation has reached an extreme. In them the inner surface of the coxa has a channel or notch for the ovipositor and the abdomen is attached high on the propodeum. Some Aulacinae of the genus *Aulacus* and all the Gasteruptiinae have lost the coxal groove, but all have retained the high attachment of the abdomen. The species of *Aulacus* without the coxal groove are mostly those with short ovipositors, and it thus appears that lack of ovipositor length made the need for coxal bracing obsolete. The primitive Gasteruptiinae (*Hyptiogaster*, etc.) have very short ovipositors and presumably their coxal grooves also disappeared with lack of use, and the long ovipositors of the more specialized Gasteruptiinae were redeveloped after the coxal grooves and the habit of holding the ovipositor between the coxae were lost by their short-oviposited ancestors.

Other evidences that the Aulacinae are more primitive than the Gasteruptiinae are the more complete venation, lack of a fold in the front wing, more generalized mouth parts, less complete fusion of the first and second abdominal tergites, and less extreme thoracic modifications.

The subfamily has been divided into numerous genera and subgenera on venation, the number of teeth on the tarsal claws, the presence or absence of a tooth on the front margin of the pronotum, and a few other characters. An evaluation of these divisions shows them largely unnatural. Many of the venational features used for generic distinctions are variable within a species, and though the other characters are constant and valuable for specific separation their use for generic groupings often produces aggregates in which the species have in common only the key characters by which they were brought

together. I can make only one division in the subfamily that is supported by enough correlating characters to convince that it is important and natural, and propose to consider the resulting two sections the only valid genera. Both are world-wide in distribution and contain diverse sets of species. Among them are natural subgroupings that can be defined, but the significance of these is relatively minor, and I should rank them as species groups or as subgenera rather than as genera.

## KEY TO THE GENERA OF AULACINAE

1. Tarsal claws with two or more teeth; occipital carina nearly always present; groove on inner side of hind coxa of female situated beyond middle of coxa, always present and usually vertical; outer apical margin of middle tibia produced as an acute tooth; as seen from side, top and front faces of median lobe of mesoscutum meeting at an angle or hyperbola usually less than 90°.

**Aulacostethus**

Tarsal claws apparently simple, but each with a single basal tooth difficult to see; occipital carina absent; groove on inner side of hind coxa of female, when present, either situated basad of middle or very oblique; outer apical margin of middle tibia sometimes produced as a tooth; as seen from side, top and front faces of median lobe of mesoscutum meeting at an angle or hyperbola not greater than 90°, or meeting in a rounded curve that shows no angle-----**Aulacus**

## Genus AULACOSTETHUS Philippi

- Aulacostethus* PHILIPPI, Ent. Zeit. Stettin, vol. 34, p. 302, 1873. Type: *Aulacostethus rubriventer* Philippi. Monobasic.
- Pristaulacus* KIEFFER, Ann. Soc. Ent. France, vol. 68, p. 813, 1900. Type: *Pristaulacus chlapowskii* Kieffer; designated by Bradley, 1908. (New synonymy.)
- Deraiodontus* BRADLEY, Ent. Student, vol. 2, p. 29, 1901. Type: *Aulacus montanus* Cresson; designated by Bradley, 1901.
- Oleisoprister* BRADLEY, Trans. Amer. Ent. Soc., vol. 27, p. 324, 1901. Type: (*Aulacus firmus* Cresson) = *resutorivorus* Westwood; original designation.
- Anaulacus* SEMENOW, Rev. Russe Ent., vol. 3, p. 173, 1903 (preoccupied). Type: *Aulacus sibiricola* Semenow. Monobasic.
- Semenovia* KIEFFER, in André, Species des hyménoptères d'Europe et d'Algérie, vol. 7 bis, p. 382, 1903 (preoccupied). New name for *Anaulacus* Semenow.
- Odontaulacus* KIEFFER, in André, Species des hyménoptères d'Europe et d'Algérie, vol. 7 bis, p. 382, 1903. Type: *Aulacus rufitarsis* Cresson; designated by Bradley, 1908. (New synonymy.)
- Semenovius* BRADLEY, Trans. Amer. Ent. Soc., vol. 34, p. 123, 1908. New name for *Anaulacus* Semenow.
- Tropaulacus* BRADLEY, Trans. Amer. Ent. Soc., vol. 34, p. 125, 1908. Type: *Tropaulacus torridus* Bradley. Monobasic. (New synonymy.)
- Neaulacus* BRADLEY, Trans. Amer. Ent. Soc., vol. 34, p. 126, 1908. Type: *Aulacus occidentalis* Cresson; original designation.
- ?*Disaulacinus* KIEFFER, Bull. Soc. Ent. France, 1910, p. 350. Type *Disaulacinus flavimanus* Kieffer; first species included (by Kieffer, 1911). (New synonymy.)
- Tetraulacinus* KIEFFER, Bull. Soc. Ent. France, 1910, p. 350. Type: *Pristaulacus rufobalteatus* CAMERON; first species included (by Kieffer, 1911). (New synonymy.)

*Psilaulacus* KIEFFER, Bull. Soc. Ent. France, 1910, p. 350. Type: *Psilaulacus annulatus* KIEFFER; first species included (by Kieffer, 1911).

?*Aulacites* COCKERELL, Proc. U. S. Nat. Mus., vol. 51, p. 102, 1916. Type: *Aulacites secundus* Cockerell; original designation. (New synonymy.)

The characters of this genus are outlined in the key to genera. The Nearctic species *bilobatus*, *editus*, *minor*, and *rufitarsis* form a natural group that Kieffer and others would segregate as the genus *Odontaulacus*, distinguished by having only two teeth on the tarsal claws. But when this claw character is applied to exotic species some extraneous elements are added to the group, and for the present I include them all in *Aulacostethus* without even a subgeneric separation. Other natural groupings of the Nearctic species are not at present particularly evident. *Pristaulacus* is the traditional name for most species of this genus. Study of a specimen of the genotype of *Aulacostethus* (at Cambridge) shows that this name must replace *Pristaulacus*.

[KEY TO THE NEARCTIC SPECIES OF AULACOSTETHUS

1. Forewing black, with or without a yellow cross band.....2  
Forewing hyaline, subhyaline, or suffused with reddish brown, with or without dark spots or bands.....3
2. Forewing with a median yellowish cross band (fig. 15, a); tibiae and tarsi black.....1. *fasciatus* Say  
Forewing entirely black; tibiae and tarsi yellow.....2. *violaceus* Bradley
3. Forewing with the front half brown, most of rest subhyaline (fig. 15, b).  
3. *torridus* Bradley
- Forewing colored otherwise.....4
4. Tarsal claws each with a submedian large tooth and a subbasal small tooth; forewing without spots.....5  
Tarsal claws each with three to five teeth, of which the basal tooth is small; forewing nearly always with a dark spot below stigma and often with a dark apical mark (fig. 15, c-i).....8
5. Hind femur black to dark brown.....6  
Hind femur ferruginous to reddish brown.....7
6. Propleurum distinctly punctured; hind coxa and side of thorax rather opaque and rather finely sculptured; posterior half of top of head with dense fine punctures; hind tarsus dark brown; apical half of female abdomen black; first tergite (excluding the partly fused second tergite) of female about 1.3 as long as wide, of male about 1.45 as long as wide.  
18. *bilobatus* Provancher
- Propleurum not distinctly punctured; hind coxa and side of thorax polished and with moderately coarse sculpture; posterior half of top of head with sparse fine punctures; hind tarsus stramineous to light brown; apical half of female abdomen ferruginous, sometimes a little infuscate; first tergite (excluding the partly fused second tergite) of female about 1.5 as long as wide, of male about 1.9 as long as wide.....19. *rufitarsis* Cresson
7. Hind tibia concolorous with hind femur and hind tarsus, not darker than these; front and middle second trochanters and extreme bases of front and middle femora brownish ferruginous; front and middle coxae and trochanters of male usually ferruginous; anterior dorsolateral corners of mesoscutum somewhat angular; ovipositor sheath about 1.25 as long as forewing.  
20. *editus* Cresson

- Hind tibia distinctly more infusate than hind femur and tarsus; front and middle second trochanters and extreme bases of front and middle femora piceous; front and middle coxae and trochanters of male piceous; anterior dorsolateral corners of mesoscutum rounded; ovipositor sheath about 1.5 as long as forewing..... 21. *minor* Cresson
8. Front margin of pronotum with a forward-projecting, triangular tooth just above its midlength..... 9  
Front margin of pronotum without a distinct tooth near its midlength (but sometimes with an indistinct tooth near top)..... 11
9. Upper face of hind coxa smooth, without cross wrinkles; tarsal claws each with three teeth; hind femur black, tibiae and front and middle femora yellow; occipital carina a narrow rim..... 10. *flaviviridis* Bradley  
Upper face of hind coxa with cross wrinkles; tarsal claws each with four teeth; all femora and tibiae approximately concolorous; occipital carina produced as a flange, somewhat reflexed..... 10
10. Third tergite ferruginous; wing spot below stigma large, entering base of radial cell (fig. 15, *c*); legs black; occipital carina a flange that is about 0.8 as wide as first flagellar segment (fig. 15, *l*); British Columbia, Oregon, and California..... 4. *montanus* Cresson  
Third tergite black; wing spot below stigma usually small so as not to enter base of radial cell (fig. 15, *d*, or in some males the spot obsolete); legs beyond trochanters fulvous to black; occipital carina a flange about 0.4 as wide as first flagellar segment; Atlantic west to Manitoba and Colorado.  
5. *ater* Westwood
11. Upper side of hind coxa smooth, without cross wrinkles; propleurum without distinct punctures..... 12  
Upper side of hind coxa with more or less distinct cross wrinkles; propleurum with weak to strong punctures..... 16
12. Wings hyaline (except for spots, fig. 15, *h*); hind femur black; head and thorax black; punctures on frons well separated; east of Rocky Mountains.  
14. *strangaliae* Rohwer  
Wings suffused with reddish brown (except for spots, fig. 15, *i*); hind femur ferruginous, rarely black; head and thorax usually more or less ferruginous, but often entirely black; punctures on frons close, somewhat confluent; Rocky Mountains and westward..... 13
13. Temples, as seen from above, curved inward from directly behind the eye (fig. 16, *j*); head, as seen from above, about 0.80 as long as wide; lateral lobe of mesoscutum mostly smooth and polished; top of female head ferruginous, with an oblique blackish triangle projecting upward and backward from eye toward lateral ocellus (fig. 16, *j*); thorax of male marked with ferruginous, at least with a ferruginous mark on side of median lobe of mesoscutum..... 17. *foxlesei*, new species  
Temple, as seen from above, prolonged a little behind eye before curving inward (fig. 16, *i*); head, as seen from above, about 0.75 as long as wide; lateral lobe of mesoscutum mostly weakly wrinkled; top of female head ferruginous or partly or entirely black, but without an oblique blackish triangle projecting inward and backward from eye toward lateral ocellus; thorax of male of *A. occidentalis* entirely black, of *A. melleus* marked with fulvous..... 14
14. Ovipositor sheath about 2.0 as long as forewing; top of head rather shining; thorax of male marked with fulvous..... 16. *melleus* Cresson  
Ovipositor sheath about 1.2 as long as forewing; top of head rather dull; thorax of male entirely black..... 15

15. Thorax of female less than a third blackish; habitat British Columbia, Washington, Oregon, California, and Idaho.  
 15a. *occidentalis lavatus*, new subspecies  
 Thorax of female usually more than a third blackish; habitat Idaho, Wyoming, Utah, Colorado, and New Mexico. 15b. *occidentalis occidentalis* Cresson
16. Tarsal claws each with four teeth; occipital carina a prominent reflexed flange (figs. 16, *a, b*)----- 17  
 Tarsal claws each with three teeth----- 18
17. Hind coxa entirely ferruginous; thorax more or less ferruginous.  
 6. *oregonus*, new species  
 Hind coxa largely or entirely black; thorax entirely black.
7. *pacificus* Cresson
18. Occipital carina a reflexed flange that is about 0.4 as wide as the basal flagellar segment (figs. 16, *c, d*); temple strongly convex----- 19  
 Occipital carina a narrow rim, not more than 0.2 as wide as the basal flagellar segment (figs. 16, *e-g*); temple less strongly convex----- 20
19. First tergite about 2.8 as long as wide in female (male unknown); third tergite entirely ferruginous; fifth and following segments entirely black; head, as seen from above, about 0.78 as long as wide (fig. 16, *c*); ovipositor sheath about 1.5 as long as the forewing----- 8. *arizonicus*, new species  
 First tergite about 1.6 as long as wide in female, about 1.9 as long as wide in male; third tergite usually largely black, when entirely ferruginous the fifth and following segments partly ferruginous below; head, as seen from above, about 0.70 as long as wide (fig. 16, *d*); ovipositor sheath about 1.2 as long as forewing----- 9. *resutorivorus* Westwood
20. Frons with close fine transverse wrinkles; California.  
 11. *californicus*, new species  
 Frons without transverse wrinkles or with only faint ones----- 21
21. Temple, as seen from above, longer than eye (fig. 16, *f*); frons distinctly punctate; median lobe of mesoscutum without or with weak transverse ridges; hind tibia fuscous, paler at ends----- 12. *canadensis*, new species  
 Temple, as seen from above, shorter than eye (fig. 16, *g*); frons sparsely and very weakly punctate; median lobe of mesoscutum with transverse ridges; hind tibia yellowish, not or weakly infuscate--- 13. *stigmaterus* Cresson

1. *AULACOSTETHUS FASCIATUS* (Say), new combinationFIGURE 15, *a*

*Aulacus fasciatus* SAY, Contrib. Maclurian Lye. Arts Sci., vol. 1, p. 67, 1829; LeConte ed., vol. 1, p. 373. Type: ♀, Ohio (destroyed).

*Forewing black, with a transverse oval yellowish spot.*

Female: Forewing about 12.5 mm. long; as seen from above, head about 0.74 as long as wide; frons with rather sparse, moderately small punctures; top of head with small moderately distant punctures; as seen from above, the temple about 0.7 as long as the eye, full, strongly and evenly convex; occipital carina weak and very blunt; propleurum with rather coarse, moderately close punctures; pronotum with close, deep, often confluent punctures and some short sharp wrinkles, without a tooth on its anterior edge; hind coxa above with coarse deep punctures that are somewhat confluent with transverse wrinkles; tarsal claws with four teeth; ovipositor sheath about 0.9 as long as the forewing.

Black. More or less distinct piceous stains on the head, mandible, and legs; wings black, the forewing with a slightly postmedian, oval, somewhat oblique transverse yellow area as indicated in figure.

Male: Unknown.

*Specimens*.—♀, Marion County, Ark., J. C. Bridwell (Washington). ♀, Washington, D. C., August 9, 1920, L. H. Weld (Washington). ♀, La Salle County, Ill., August 1935, F. G. Werner (Cambridge). ♀, Michigan, Townsend (Washington). ♀, Cadet, Mo., J. G. Barlow (Washington). ♀, Hollister, Mo., August 12, 1912, H. H. Knight (Ithaca). ♀, Harrisburg, Pa., reared from *Carya ovata*, August 7, 1914, W. S. Fisher (Washington). 2 ♀, Harrisburg, Pa., August 11, 1912, Champlain (Washington). ♀, no data, from A. Fitch collection (Washington).

This species is rare. The records indicate that it occurs from the Atlantic to the one-hundredth meridian in the Transition and Upper Austral Zones. Adults fly in the first half of August.

### 2. AULACOSTETHUS VIOLACEUS (Bradley), new combination

*Deraiodontus violaceus*, BRADLEY, Zeitschr. Hymen. Dipt., vol. 5, p. 26, 1905.

Lectotype: ♀, Washington, D. C. (Washington); hereby selected.

*Forewing entirely black.*

Forewing about 12 mm. long; as seen from above, head about 0.65 as long as wide; frons with fine, rather sparse punctures; top of head with fine, moderately distant punctures; as seen from above, the temple about 0.9 as long as the eye, full, strongly convex; occipital carina sharp and thin, but not produced; flagellum shorter than in other Nearctic species, the first segment about 3.0 as long as wide and the subapical segments about 2.0 as long as wide; propleurum with a few large, weak punctures; pronotum with strong reticulate wrinkling, its front edge with a triangular projecting tooth; tarsal claws with four or five teeth; ovipositor sheath relatively shorter than in the other Nearctic species, about 0.5 as long as the forewing.

Black. Flagellum fulvous with the basal  $0.4 \pm$  and apical  $0.1 \pm$  blackish, the rest more or less infuscate; under side of scape of male ferruginous; legs beyond femora fulvous, in the male the fore and middle femora also fulvous and the hind femur brown; wings black.

*Specimens*.—♂, Washington, D. C. (allotype, Washington). ♀, Vinton County, Ohio, June 20, 1901 (Columbus). ♀, Nelson County, Va., July 24, 1927, W. Robinson (Washington).

### 3. AULACOSTETHUS TORRIDUS (Bradley), new combination

FIGURE 15, b

*Tropaulacus torridus* BRADLEY, Trans. Amer. Ent. Soc., vol. 34, p. 125, 1908.

Type: ♀, Brownsville, Tex. (Lawrence).

*Forewing with the front half brown, most of the rest subhyaline.*



Type female: Forewing about 9 mm. long; as seen from above, head about 0.75 as long as wide; frons with small weak punctures; top of head with sparse punctures that are so small it is almost impunctate; temple full, moderately convex; occipital carina strong but

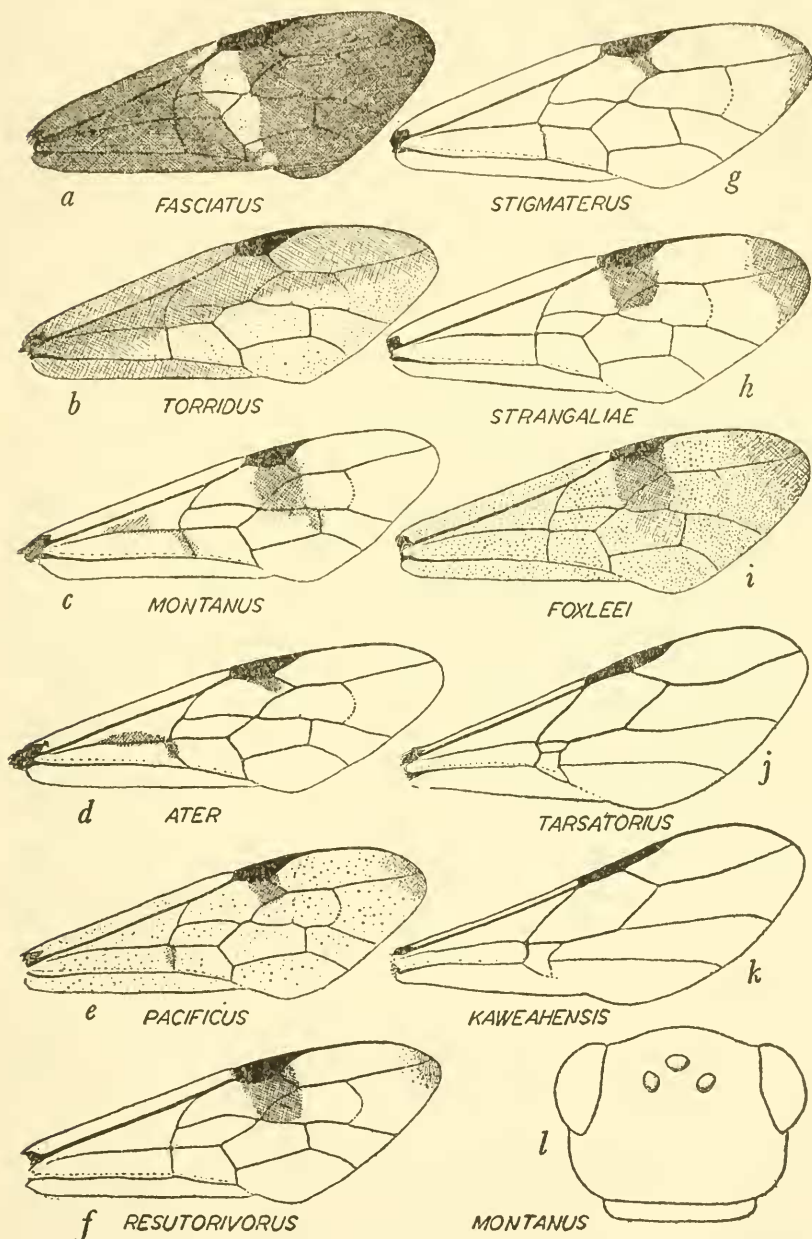


FIGURE 15.—*a-i*, Forewings of species of *Aulacostethus* showing color patterns; *j, k*, forewings of species of *Rhydinofoenus* showing venations; *l*, head of *Aulacostethus montanus*.

not produced; propleurum with weak, medium-sized punctures; pronotum with strong coarse wrinkles, its anterior swelling with scattered coarse punctures, its anterior edge without a projecting tooth; hind coxa above rugosopunctate; tarsal claws each with 4 teeth; ovipositor sheath about 0.86 as long as forewing.

Light brown. Apical flagellar segments infusate; wings suffused with pale brown, the front wing marked with medium dark brown (fig. 15, *b*); hind wing a little darker brown anteriorly than elsewhere; much of mesopleurum, metapleurum, and propodeum indefinitely marked with medium brown; hind coxa, apical 0.3 of first tergite, and all of second tergite medium brown; ovipositor sheath light brown, blackish apically. Hind legs beyond coxae lacking.

*Specimen*.—Redescribed and figured from the unique type.

4. AULACOSTETHUS MONTANUS (Cresson), new combination

FIGURE 15, *c, l*

*Aulacus montanus* CRESSON, Trans. Amer. Ent. Soc., vol. 7, p. 256, 1879. Type: ♀, Nevada (Philadelphia).

*Deraiodontus fuscalatus* BRADLEY, Trans. Amer. Ent. Soc., vol. 27, p. 321, 1901. Type: ♀, Washington (Philadelphia.) (New synonymy.)

*Pristaulacus (Oleisoprister) dentatus* BRADLEY, Trans. Amer. Ent. Soc., vol. 34, p. 126, 1908. Type: ♂, Ormsby County, Nev. (Claremont, Calif.). (New synonymy.)

*Front margin of pronotum with a triangular projecting tooth; occipital carina about 0.8 as high as the width of the first flagellar segment.*

Forewing about 9.5 mm. long; as seen from above, head about 0.78 as long as wide; frons with fine, weak, usually rather close punctures; top of head with very fine, moderately distant punctures; as seen from above, the temple about 0.8 as long as the eye, full, strongly convex; occipital carina about 0.8 as high as the diameter of the first flagellar segment, strongly reflexed; propleurum not distinctly punctate; pronotum mostly with sharp, rather distant wrinkles, but its anterior swelling smooth and with distant punctures; anterior edge of pronotum with a triangular projecting tooth; hind coxa above with transverse wrinkles; tarsal claws each with four teeth; ovipositor sheath about 1.5 as long as the forewing.

Black. Second and third abdominal segments, apical part of first segment, more or less of fourth segment, and sometimes basal part of fifth segment ferruginous; forewing with dark fuscous spots as in figure 15, *c*.

The type of *dentatus* Bradley has four teeth on each tarsal claw, rather than three as indicated by Bradley's placing it in *Oleisoprister*.

*Specimens*.—19♂, 13♀, from BRITISH COLUMBIA (Seton Lake); CALIFORNIA (Alameda County, Fresno, Glacier Lodge on Big Pine Creek in Inyo County at 4,000 to 5,000 feet, Gold Lake in Sierra

County, Kings River Canyon in Fresno County, Laurel, Los Angeles County, Meadow Valley in Plumas County at 4,000 to 5,000 feet, Mount Diablo, Riverton, San Francisco County, Santa Cruz Mountains, and Switzer's Trail in the San Gabriel Mountains); and OREGON (Antelope Mountain in Harney County at 6,500 feet, Corvallis, Madras, Oregon Trail Camp in the Whitman National Forest at 5,000 feet, and Peoria). Most of the collection dates are in June, July, and August. Those falling elsewhere are April 13 at Mount Diablo, Calif.; May 7 in Meadow Valley in Plumas County, Calif., and September 3 at Fresno, Calif. There are two reared lots among the above material, a male from *Chrysobothris femorata* in apricot (?), at Fresno, Calif., September 3, 1918, by R. D. Hartman; and two males from *Xylotrechus nauticus* on *Quercus californicus* at Laurel, Calif., June 27, 1918, by F. B. Herbert.

This species to date has been collected in California, Oregon, and a female from Seton Lake, British Columbia.

5. AULACOSTETHUS ATER (Westwood), new combination

FIGURE 15, d

*Aulacus ater* WESTWOOD, Ann. Nat. Hist., vol. 7, p. 538, 1841; Trans. Ent. Soc.

London, vol. 3, p. 265, 1843. Type: ♀, Nova Scotia (Oxford University).

*Aulacus Abbottii* WESTWOOD, Ann. Nat. Hist., vol. 7, p. 538, 1841; Trans. Ent.

Soc. London, vol. 3, p. 266, 1843. Type: ♀, Georgia (London).

*Aulacus niger* SHUCKARD, Entomologist, vol. 1, p. 124, 1841. Type (destroyed): North America.

*Pristaulacus (Pristaulacus) hopkinsii* (as *hopkinsi* in key) BRADLEY, Trans. Amer. Ent. Soc., vol. 34, p. 127, 1908. Type: ♀, Kirbyville, Tex. (Ithaca). (New synonymy.)

*Pristaulacus aterrimus* KIEFFER, Ann. Soc. Ent. France, vol. 80, p. 230, 1911. New name for *Aulacus ater* Westwood.

*Pristaulacus floridana* ROHWER, Proc. U. S. Nat. Mus., vol. 45, p. 534, 1913. Type: ♀, Bartow, Fla. (Washington). (New synonymy.)

*Front margin of pronotum with a triangular projecting tooth; upper side of hind coxa transversely wrinkled, not coarsely punctate; occipital carina about 0.3 as high as width of first flagellar segment.*

Forewing about 11.0 mm. long; as seen from above, head about 0.75 as long as wide; frons with small, rather closely spaced punctures; top of head with fine, moderately close punctures; temple full, strongly convex; occipital carina about 0.3 as high as the diameter of the first flagellar segment, somewhat reflexed; propleurum with moderately sparse, fine weak punctures; pronotum rugosopunctate, anteriorly with the punctures distinct, its anterior edge with a projecting triangular tooth; hind coxa above with close transverse wrinkles; tarsal claws each with four teeth; ovipositor sheath about 1.75 as long as the forewing.

Black. Tegula piceous; forewing marked with dark fuscous as in figure 15, d, the basal spot variable, the spot next to the stigma sometimes

absent in males and sometimes large enough to invade the cubital cell and the extreme base of the radial cell; legs beyond coxae or first trochanters ferruginous to black; first abdominal segment except basally and more or less of the basal part of the second segment ferruginous.

The description of *Aulacus niger* Shuckard is too brief for a certain identification and its type is lost. Westwood (Trans. Ent. Soc. London, vol. 3, p. 265, 1843) synonymized *niger* with his own *ater*, and his disposition of the name is followed. A male from Tyler County, Tex., and a female from Homestead, Fla., are unusual in extensive wing markings and an unusual amount of ferruginous color. Possibly they represent a distinct race. The type of *Pristaulacus floridana* Rohwer belongs to this form, and J. F. Perkins's notes on the type of *Aulacus abbottii* Westwood indicate that it belongs here too.

*Specimens*.—8♂, 31♀, from ALABAMA (Mobile); COLORADO (El Paso County); FLORIDA (Homestead); MANITOBA (Victoria Beach); MARYLAND (Cabin John and Glen Echo); MASSACHUSETTS (Springfield); MICHIGAN (Agricultural College and Baraga County); MINNESOTA (Cass County and Itasca); NEW YORK (Albany, Bath, Ithaca, and Pine Lawn on Long Island); NORTH CAROLINA (Bent Creek at Asheville, and Durham); PENNSYLVANIA (Philadelphia and Rockville); QUEBEC (Joliette, Laniel, and Norway Bay); TEXAS (Doucette in Tyler County); and VIRGINIA (Falls Church). Dates of capture are mostly in June, July, August, and September. Those outside this range are two females taken at Mobile, Ala., by E. C. Van Dyke on December 12 and January 3. Specimens from four localities bear the note that they were collected on or reared from *Pinus*.

This species occurs from the Atlantic west to about the one-hundredth meridian from the Canadian Zone to the Lower Austral Zone, and it has been taken also in eastern Colorado. It is associated with *Pinus*.

#### 6. AULACOSTETHUS OREGONUS, new species

FIGURE 16, a

*Tarsal claws each with four teeth; hind coxa ferruginous.*

Forewing about 10 mm. long; as seen from above, head about 0.85 as long as wide; temple about as in *Aulacostethus pacificus* but a little shorter and more strongly rounded (fig. 16, a); ovipositor sheath about 1.75 as long as forewing. Otherwise structurally similar to *A. pacificus*.

Female: Ferruginous. Antenna except scape, maxillary palpus except last three segments, labial palpus except last segment, sometimes an area on top of the head in front of the ocelli, front end and inner edge of propleurum, mesosternum, metasternum laterally, areas near base of forewing, and a narrow subapical transverse band on

second tergite black or blackish; wings marked as in *A. pacificus* except that the apical dark spot on the forewing is a little larger and darker.

Male: Colored like the female except as follows: Top of head black; thorax black with the propleurum centrally, pronotum except anteriorly, tegula, lateral spots on the median and lateral lobes of mesoscutum, and some indefinite stains on the propodeum fulvous; abdomen with a median transverse band on first tergite, a subapical transverse band on second tergite, an indefinite apical dorsal spot on fourth tergite, a larger one on the fifth, and the dorsal half of the sixth and seventh tergites black.

Type: ♀, Corvallis, Oreg., August 24, 1935, G. R. Ferguson (Corvallis).

Paratypes: ♀, Corvallis, Oreg., July 21, 1896 (Ithaca). ♀, Sulphur Springs, Benton County, Oreg., July 26, 1941, G. R. Ferguson (Townes). ♂, Hugo, Oreg., July 1, 1925, H. A. Scullen (Washington).

#### 7. AULACOSTETHUS PACIFICUS (Cresson), new combination

FIGURES 15, *e*; 16, *b*

*Aulacus pacificus* CRESSON, Trans. Amer. Ent. Soc., vol. 7, p. 256, 1879. Type: ♀, Vancouver Island, British Columbia (Philadelphia).

*Tarsal claws each with four teeth; front margin of pronotum without a projecting tooth; hind coxa partly or entirely black; as seen from above, head about 0.9 as long as wide.*

Forewing about 9 mm. long; as seen from above, head about 0.9 as long as wide; frons with close, fine punctures and some transverse wrinkling; top of head with very fine, rather sparse punctures; as seen from above, temple a little flatter or more weakly convex than in any other Nearctic species (fig. 16, *b*); occipital carina about 0.35 as high as the diameter of the first flagellar segment, somewhat reflexed; propleurum with moderately sparse, rather weak, medium sized punctures; pronotum closely, weakly, and rather finely punctate and rugose, its front margin without a projecting tooth; tarsal claws each with four teeth; ovipositor sheath about 1.9 as long as the fore wing.

Female: Black. Clypeus and mandible brown; fore and middle legs beyond the first trochanter and hind tarsus fulvous; tegula and hind second trochanter brown; hind tibia dark brown; wings weakly tinted with orange-brown, the forewing marked with fuscous as in figure 15, *e*; abdomen ferruginous, the basal part of the first segment, a subapical transverse band on the second tergite, and the apical part of the abdomen dorsally beginning with the fourth or with the apical half of the third tergite black.

Male: Colored like the female except as follows: Face and cheek mostly tan; under side of scape fulvous; legs fulvous, approximately

the basal fourth of the middle coxa and the basal half of the hind coxa blackish brown; hind tibia brown.

*Specimens*.—♀, Robson, British Columbia, July 2, 1939, H. R. Foxlee (St. Paul). ♀, Robson, British Columbia, July 10, 1938, H. R. Foxlee (Townes). ♀, Seton Lake, Lillooet, British Columbia, June 27, 1926, J. McDunnough (Ottawa). ♀, Shawnigan, British Columbia, July 23, 1904 (Washington). ♀, Douglas Canyon, Colo., July 9, 1916, W. D. Edmonston (Washington). ♀, Moscow, Idaho, C. V. Piper (Washington). ♂, Corvallis, Oreg., July 15, 1896 (Washington). ♀, Blue Mountains, Wash., July 1896, C. V. Piper (Washington).

This species seems to have about the same range as *Pseudotsuga taxifolia* (Douglas fir).

#### 8. AULACOSTETHUS ARIZONICUS, new species

FIGURE 16, c

*Forewing about 13.5 mm. long; body and legs black with abdomen red from the apical part of the first tergite to the basal part of the fourth.*

Type female: Forewing 13.5 mm. long; as seen from above, head 0.78 as long as wide; temple strongly evenly convex (fig. 16, c), a little longer and fuller than in *A. resutorivorus*; first tergite 2.8 as long as wide; ovipositor sheath 1.5 as long as the forewing. Otherwise, structurally similar to *A. resutorivorus*.

Black. Wings hyaline, the forewing marked with fuscous as in *A. resutorivorus* but with the apical wing spot a little larger and darker; abdomen ferruginous, black as follows: base of first tergite, dorsal basal stripe fading out at apical 0.8 of first tergite, apical 0.5 of fourth tergite, and all of the following tergites.

Male: Unknown.

Type: ♀, Chiricahua Mountains, Ariz., July 26, 1937, D. J. and J. N. Knull (Columbus).

This species is closely related to *A. resutorivorus*.

#### 9. AULACOSTETHUS RESUTORIVORUS (Westwood), new combination

FIGURES 15, f; 16, d

*Aulacus Resutorivorus* WESTWOOD, Trans. Ent. Soc. London, ser. 2, vol. 1, p. 224, 1851. Type: ♀, Hudson Bay (London).

*Aulacus firmus* CRESSON, Trans. Amer. Ent. Soc., vol. 7, p. 256, 1879. Type: ♀, Colorado (Philadelphia), (New synonymy.)

*Aulacus subfirmus* BRADLEY, Ent. Student, vol. 2, p. 31, May 1901.—VIERECK, Trans. Amer. Ent. Soc., vol. 27, p. 325, Nov. 1901. Type: ♀, Riverton, N. J. (Philadelphia). (New synonymy.)

*Head exceptionally short, about 0.70 as long as wide (fig. 16, d); occipital carina high and somewhat reflexed.*

Forewing about 12 mm. long; as seen from above, head about 0.7 as long as wide; frons with medium-sized dense punctures, medially more or less finely punctatorugose or transversely wrinkled; top of

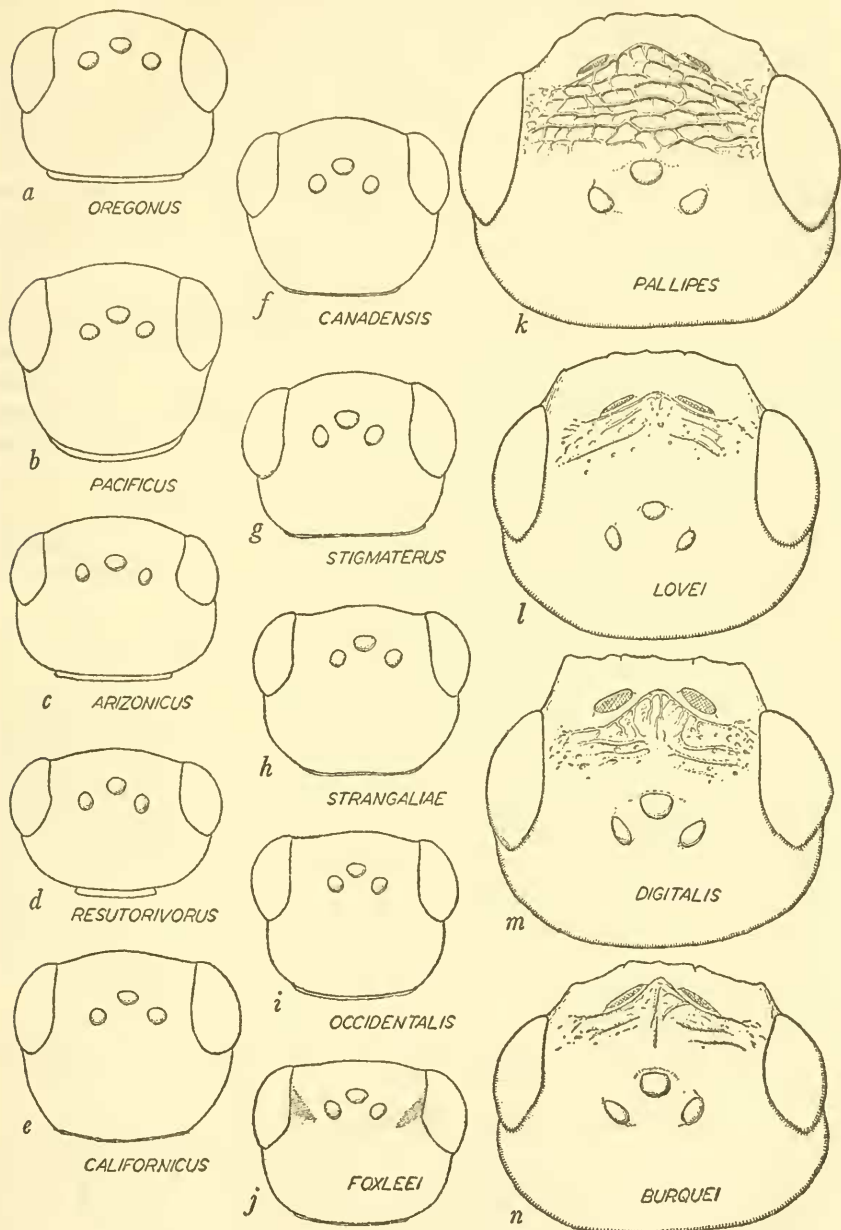


FIGURE 16.—*a-j*, Heads of species of *Aulacostethus* viewed from directly above showing occipital carinae and lengths and shapes of temples; *k-n*, heads of species of *Aulacus* viewed anterodorsally showing frontal wrinklins.

head with small, weak, rather close punctures and with some weak wrinkling; as seen from above, the temple more abruptly incurved and therefore shorter and smaller than in the other Nearctic species (fig. 16, *d*); occipital carina about 0.3 as high as the diameter of the first flagellar segment, somewhat reflexed; propleurum with moderately sparse, fine weak punctures; pronotum transversely ridged in the scrobe, the rest closely irregularly punctate or punctatorugose; front edge of pronotum without a projecting tooth; hind coxa above entirely rugosopunctate with rather small punctures, or the sculpture more or less obsolete centrally, leaving a smooth area; tarsal claws with three teeth; abdomen unusually stout, the first tergite about 1.9 as long as wide in the male and about 1.6 as long as wide in the female; ovipositor sheath about 1.2 as long as the forewing.

Black. Wings faintly brownish, marked with fuscous as shown in figure 15, *f*; legs beyond first trochanters brownish ferruginous to black; abdomen varying from black with a ferruginous lateral mark on the suture between the first and second tergites to ferruginous except for the following black marks: a basal dorsal stripe on the first tergite, a median dorsal transverse band on the fourth tergite, a larger one on the fifth tergite, and all but the ventral parts of the sixth and seventh tergites. A typical coloration is for the abdomen to have a broad red-bordered black saddle on the second tergite, much of its underside red, and the rest black.

*Specimens*.—5 ♂, 30 ♀, from ALBERTA (Banff at 4,500 feet, Edmonton, and Nordegg); BRITISH COLUMBIA (Trinity Valley at Lumby); CALIFORNIA (Meyers); COLORADO (South Boulder Canyon); CONNECTICUT (Norfolk); DISTRICT OF COLUMBIA (Rock Creek Park); MAINE (Paris and Tim Pond Plantation); MICHIGAN (Whitefish Point); MONTANA (Missoula); ONTARIO (Ottawa); OREGON (Alesia in Benton County and Klamath Falls); PENNSYLVANIA (Harrisburg, Hummelstown, and Linglestown); QUEBEC (Fort Coulonge and Hemmingford); VIRGINIA (Falls Church); and WASHINGTON (Olympia). Dates of capture fall mostly in June, July, and August, those outside these months being May 28 in Rock Creek Park, D. C., and September 25, at Missoula, Mont. Notes on specimens from two localities associate the species with *Pinus*.

This species is transcontinental in the Canadian and Transition Zones. It has been collected on *Pinus*.

#### 10. AULACOSTETHUS FLAVICRURUS (Bradley), new combination

*Deraiodontus flavicrurus* BRADLEY, Trans. Amer. Ent. Soc., vol. 27, p. 322, 1901.

Type: ♀, Virginia (Philadelphia).

*Pristaulacus flavipes* KIEFFER, Arkiv Zool., vol. 1, p. 559, 1904. Type: ♂, Illinois (Stockholm). (New synonymy.)

*Front margin of pronotum with a forward-projecting tooth; tarsal claws each with three teeth.*



Forewing about 8.0 mm. long; as seen from above, head about 0.73 as long as wide; frons with fine, weak, sparse punctures; top of head with very fine, rather sparse punctures; temple full, strongly convex; occipital carina thin and sharp, not produced; propleurum without distinct punctures; pronotum polished and strongly wrinkled, its forward edge with a triangular projecting tooth; upper surface of hind coxa smooth and polished; tarsal claws each with three teeth; ovipositor sheath about 1.45 as long as the forewing.

Black. Clypeus, face, and lower lateral corners of frons of male, scape except above, under side of pedicel of male, and front and middle legs beyond coxae fulvous; mandible except apically and palpi except basally brownish stramineous; fore coxa fulvous, more or less blackish basally; middle coxa black with the apex fulvous; hind second trochanter and base and apex of hind femur fulvous; hind tibia and tarsus yellow; forewing marked with fuscous about as in *A. strangaliae*, but the dark spots averaging a little smaller; first abdominal segment ferruginous, black basally and dorsally; second segment ferruginous with a variable transverse fuscous dorsal mark; third segment more or less ferruginous basally and ventrally.

The original description of *Pristaulacus flavipes* Kieffer states "thorax unbewehrt," but an examination of the type shows it to have the typical forward-projecting pronotal tooth.

*Specimens*.—4 ♂, 18 ♀, from MARYLAND (Bowie); MICHIGAN (Bay County and Douglas Lake); NEW YORK (Elmira, Greene County, North Fairhaven, and Poughkeepsie); OHIO (Delaware County); ONTARIO (Ottawa); PENNSYLVANIA (Carlisle Junction, Inglenook, and Rockville); SOUTH CAROLINA (River Falls in Greenville County at 3,000 feet); and VERMONT (Grand Isle, Laurel Lake at Jacksonville, and Rutland). Collection dates fall mostly in June and July and range from May 28 at Inglenook, Pa., to August 4 at Elmira, N. Y.

This is a species of the Transition Zone of the Eastern States, ranging from Vermont, Ontario, and Michigan south to the mountains of South Carolina.

#### 11. AULACOSTETHUS CALIFORNICUS, new species

FIGURE 16, e

*Tarsal claws each with three teeth; upper side of hind coxa with transverse wrinkles; frons with close fine transverse wrinkles; as seen from above, head about 0.84 as long as wide.*

Forewing about 9.5 mm. long; as seen from above, head about 0.84 as long as wide; frons with transverse wrinkles and with rather small, rather close punctures; top of head with fine close punctures; temple rather long and weakly convex (fig. 16, e); occipital carina sharp but not produced; propleurum with rather close, small punctures; pro-

notum wrinkled, the anterior swelling punctatorugose; forward edge of pronotum without a forward-projecting tooth near its midlength, but at its upper end with a weak toothlike projection; hind coxa above with close transverse ridges and some indistinct punctures; tarsal claws each with three teeth; ovipositor sheath of unique female curled and not measurable, but apparently about 1.3 as long as forewing.

Black. Clypeus brown laterally; mandible mostly light brown; fore and middle legs beyond first trochanters brownish ferruginous, paler stramineous brown distally; hind second trochanter and base and apex of hind femur brown; hind tibia dark brown, its ends yellowish brown; hind tarsus fulvous; forewing with a fuscous spot below the stigma, a smaller one at the end of the radius, and a very small one on the nervulus; abdomen ferruginous, the basal part of the first segment black, in the female the fifth and following tergites fuscous dorsally, in the male the third tergite with a small transverse subapical spot, the fourth tergite with a similar but larger spot, and the fifth and following segments black.

Type: U. S. N. M. no. 58824, ♀, Patricks Creek, Calif., September 14, 1916, J. E. Patterson, reared from old cones of *Pinus attenuata* infested with *Paratimia conicola* and *Chrysophania placida* (Washington).

Paratype: ♂, Copper, Calif., June 16, 1915, I. D. Sargent, reared from *Paratimia conicola* in *Pinus attenuata* (Washington).

#### 12. AULACOSTETHUS CANADENSIS, new species

FIGURE 16, f

*Tarsal claws with three teeth; upper side of hind coxa with transverse wrinkles; frons with rather small, close punctures; head about 0.88 as long as wide.*

Forewing about 9.5 mm. long; as seen from above, head about 0.88 as long as wide; frons with small, rather close punctures; top of head with fine, moderately sparse punctures; as seen from above, temple longer than the eye, moderately convex (fig. 16, f); median lobe of mesoscutum without or with weak transverse ridges; ovipositor sheath about 1.35 as long as the forewing. Otherwise structurally similar to *A. stigmaterus*.

Colored like *A. stigmaterus* except as follows: Wing spots averaging a little smaller and paler; hind tibia fuscous with paler ends; subapical transverse mark on second tergite a little larger and darker.

Type: ♀, Aweme, "NE," Manitoba, July 13, 1925, "Spruce" (Ottawa).

Paratypes: ♂, ♀, same data as the type (Ottawa). ♀, Bangor, Maine, July, F. A. Eddy (Cambridge). ♀, "Frisland," July 17, 1897 (St. Paul).

## 13. AULACOSTETHUS STIGMATERUS (Cresson), new combination

FIGURES 15, *g*; 16, *g*

*Aulacus stigmaterus* CRESSON, Proc. Ent. Soc. Philadelphia, vol. 3, p. 134, 1864.

Type: ♀, New Jersey (Philadelphia).

*Pristaulacus punctaticeps* KIEFFER, Ann. Soc. Ent. France, vol. 79, p. 78, 1910.

Type: ♀, Jeannette, Pa. (Claremont, Calif.). (New synonymy.)

*Tarsal claws each with three teeth; upper side of hind coxa with transverse wrinkles; frons with fine, weak, sparse punctures; head about 0.76 as long as wide (fig. 16, g).*

Forewing about 8 mm. long; as seen from above, head about 0.76 as long as wide; frons with fine, weak, sparse punctures; top of head with very fine, rather sparse punctures; temple full, strongly convex (fig. 16, *g*); occipital carina thin and sharp, not produced; propleurum with moderately close, medium-sized weak punctures; pronotum longitudinally wrinkled medially, anteriorly and posteriorly with irregular wrinkles and a little irregular punctation; front edge of pronotum without a projecting tooth; median lobe of mesoscutum with moderately strong transverse ridges; upper side of hind coxa with fine, rather weak, irregular transverse wrinkles; tarsal claws each with three teeth; ovipositor sheath about 1.5 as long as the fore wing.

Black. Clypeus, central part of face, and mandible except apex brownish yellow; apical three segments of maxillary palpus light brown; scape more or less brownish; fore and middle coxae and first trochanters piceous, the rest of the fore and middle legs brownish stramineous; apex of hind femur pale brown; hind tibia light brown with the ends paler, its tarsus stramineous; forewing with infusate marks as in figure 15, *g*; abdomen ferruginous but with a basal dorsal stripe on first tergite, apical part of third, and all of following tergites blackish; second tergite with a subapical transverse infusate mark, narrowed or interrupted medially.

Male: Unknown.

*Specimens*.—40 ♀, from CONNECTICUT (Lyme); MASSACHUSETTS (Amherst, Milton, and Southbridge); MICHIGAN (Midland County); MISSOURI; NEW YORK (Connecticut Hill in Tompkins County, Geneva, Nortons Landing on Cayuga Lake, and Six Mile Creek at Ithaca); OHIO (Put in Bay); ONTARIO (Ottawa); QUEBEC (Covey Hill); and RHODE ISLAND (Westerly). Collecting dates fall mostly between the middle of June and the middle of July, with the extremes June 8 at Milton, Mass., and July 21 at Put in Bay, Ohio.

This species occurs from the Atlantic to about the one-hundredth meridian, mostly in the Transition Zone.

## 14. AULACOSTETHUS STRANGALIAE (Rohwer), new combination

FIGURES 15, *h*; 16, *h*

*Pristaulacus strangaliae* ROHWER, Proc. U. S. Nat. Mus., vol. 53, p. 157, 1917.

Type: ♀, Charter Oak, Pa. (Washington).

*Pristaulacus (Oleisoprister) taughanic* Bradley, Bull. Brooklyn Ent. Soc., vol. 21, p. 173, 1926. Type: ♀, Taughannock State Park, near Ithaca, N. Y. (Ithaca). (New synonymy.)

*Pristaulacus (Oleisoprister) glabrescens* Bradley, Bull. Brooklyn Ent. Soc., vol. 21, p. 174, 1926. Type: ♀, Albany, N. Y. (Ithaca). (New synonymy.)

*Tarsal claws each with three teeth; upper side of hind coxa smooth; pronotum without a forward-projecting tooth; forewing hyaline, with an apical and substigmatal fuscous spot (fig. 15, h).*

Forewing about 10 mm. long; as seen from above, head about 0.80 as long as wide; frons with small punctures evenly spaced at about 1.5 their diameter apart; top of head with fine, moderately distant punctures; temple full, rather strongly convex (fig. 16, *h*); occipital carina thin and sharp, not produced; propleurum without distinct punctures; pronotum coarsely and rather strongly wrinkled, its anterior edge without a projecting tooth; hind coxa above smooth and polished in the female, smooth or often weakly rugulose in the male; tarsal claws each with three teeth; ovipositor sheath about 1.4 as long as the forewing.

Black. Clypeus, mandible subapically, and underside of scape light reddish brown; apical three segments of maxillary palpus brown; fore and middle legs beyond first trochanters and hind legs beyond femur fulvous; hind second trochanter and base and apex of hind femur fulvous; forewing of female with blackish spots as in figure 15, *h*, the spots smaller and fainter in the male; abdomen ferruginous but with a basal ventral stripe on the first sternite, a basal dorsal stripe on the first tergite, the second tergite apically or subapically, and the third and following tergites black. In the male the front coxa and the front and middle second trochanters are often largely fulvous.

*Specimens*.—9 ♂, 48 ♀, from CONNECTICUT (Lyme); DISTRICT OF COLUMBIA (Washington); MAINE (Bangor, Machias, and Orono); MANITOBA (Victoria Beach); MARYLAND (Bowie, Plummers Island, and Takoma Park); MASSACHUSETTS (Springfield); MICHIGAN (Douglas Lake and Marquette); MINNESOTA (Itasca Park); NEW BRUNSWICK (Tabusintac); NEW HAMPSHIRE (Mount Washington and Randolph); NEW JERSEY (Manumuskin); NEW YORK (Albany, Hartsdale, top of Mount Whiteface, Six Mile Creek at Ithaca, Taughanic Falls, and Tuxedo); NOVA SCOTIA (Kings County and Shediac); OHIO (Cleveland); ONTARIO (Ottawa and Ridgeway); PENNSYLVANIA (Charter Oak, Clarks Valley, Delaware Water Gap, Harrisburg, Hummelstown, Inglenook, Lehigh Gap, Rockville, and Roxborough); PRINCE EDWARD ISLAND (Dalvay House); QUEBEC

(Beaumont and Laniel); RHODE ISLAND (Westerly); and VIRGINIA (Great Falls). Collection dates fall mostly in June and July. Those outside these months are: May 15 at Charter Oak, Pa.; May 29 and 30 at Bowie, Md.; and August 1 and 29 at Lyme, Conn. Some of the above specimens were reared as follows: ♀, Charter Oak, Pa., July 1, 1917, F. C. Craighead, from *Anoplodera proxima* in *Fagus*; ♀, Charter Oak, Pa., May 15, 1915, F. C. Craighead, from *Anoplodera mutabilis* in *Alnus*; ♀, Inglenook, Pa., July 1, 1915, F. C. Craighead, from *Anoplodera rubrica* in *Tsuga*; ♀, Harrisburg, Pa., June 4, 1913, F. C. Craighead, from *Anoplodera rubrica* in *Carpinus*; ♀, Lyme, Conn., August 29, 1916, A. B. Champlain, from *Ostrya*. I have twice collected the species on dead branches of *Carpinus*.

This species occurs from Prince Edward Island south to Virginia and west to Manitoba. It seems characteristic of damp bottomland woods and frequently parasitizes lepturines in *Carpinus*, a tree characteristic of those habitats.

15. AULACOSTETHUS OCCIDENTALIS (Cresson), new combination

FIGURE 16, i

*Forewing strongly suffused with brownish; temple full; ovipositor sheath about 1.2 as long as the forewing.*

Forewing about 11 mm. long; as seen from above, head about 0.74 as long as wide; top of head rather dull, with fine close punctures; temple (fig. 16, i) strongly convex and fuller than in *A. foxleei*; lateral lobe of mesoscutum weakly wrinkled all over; ovipositor sheath about 1.2 as long as the forewing. Otherwise structurally similar to *A. foxleei*.

Female: Colored like that of *A. foxleei* except as follows: Head varying from entirely ferruginous to entirely black, but never with the small blackish triangle between the eye and the lateral ocellus that is so characteristic of *A. foxleei*; thorax entirely black to entirely ferruginous; legs often more or less blackish; and forewing with the apical and substigmal dark spots usually smaller and paler than in *A. foxleei*.

Male: Colored like that of *A. foxleei* except as follows: Head, except clypeus, and thorax entirely black; apical and substigmal dark wing marks usually smaller and paler; first and second tergites entirely ferruginous or marked similar to those of *A. foxleei*; legs sometimes more or less blackish.

This species occurs in the Canadian Zone from the Pacific coast to the Rocky Mountains, with one subspecies (*A. occidentalis lavatus*) in British Columbia, Washington, Oregon, and California and the other occurring to the east. They are weakly separable in the female by the amount of black on the thorax. I do not find good differences in the males.

15a. *AULACOSTETHUS OCCIDENTALIS LAVATUS*, new subspecies

Head and thorax of female less than a third blackish; legs of female ferruginous, of male blackish only at the bases of the middle and hind coxae.

Type: U. S. N. M. No. 58826, ♀, Sunrise, at 6,400 feet on Mount Rainier, Wash., July 7, 1935, Wm. W. Baker (Washington).

Paratypes: 16 ♂, 18 ♀, from BRITISH COLUMBIA (Kaslo, Midday Valley at Merritt, Robson, Shawnigan, and Victoria); CALIFORNIA (Big Flat on Coffee Creek in Trinity County, Fallen Leaf, Gold Lake in Sierra County, Meyers, Strawberry Valley in El Dorado County, and Yosemite); IDAHO (Priest Lake); OREGON (Crater Lake, Homestead Inn on Mount Hood, Lake Basin Trail near Wallowa Lake at 4,500 to 5,500 feet, and Wallowa Mountains in Baker County); and WASHINGTON (Lake Cushman, Olympia, Red Mountain, and Mount Rainier at White River Camp and at Yakima Park). Dates of collection are rather evenly distributed from June 22 to August 13.

This subspecies is common in the Canadian Zone of British Columbia, Washington, Oregon, and California.

15b. *AULACOSTETHUS OCCIDENTALIS OCCIDENTALIS* (Cresson), new combination

*Aulacus occidentalis* CRESSON, Trans. Amer. Ent. Soc., vol. 7, p. 255, 1879. Type: ♀, Colorado (Philadelphia).

Head and thorax of female more than a third blackish; legs of female sometimes partly blackish, of male often with more than the bases of the fore and middle coxae blackish.

*Specimens*.—11 ♂, 8 ♀, from COLORADO (Ute Trail in El Paso County and Waldo Canyon); IDAHO (Centerville, Moscow, and Post Falls); NEW MEXICO (Beulah and Jemez Springs); UTAH (Navajo Lake at 9,000 feet and Parley Canyon near Salt Lake City); and WYOMING (Grand Teton National Park and Riverside in Yellowstone National Park). Dates of collection run from June 1 to August 4.

This subspecies occurs in the mountains of Idaho, Wyoming, Colorado, Utah, and New Mexico.

16. *AULACOSTETHUS MELLEUS* (Cresson), new combination

*Aulacus melleus* CRESSON, Trans. Amer. Ent. Soc., vol. 7, p. 255, 1879. Type: ♀, Nevada (Philadelphia).

*Aulacus consors* CRESSON, Trans. Amer. Ent. Soc., vol. 7, p. 255, 1879. Type: ♂, Nevada (Philadelphia).

*Pristaulacus ferrugineus* KIEFFER, Bull. Soc. Hist. Nat. Metz, ser. 2, vol. 11, p. 29, 1904. Type: ♀, Nevada (?Vienna). (New synonymy.)

*Wings strongly suffused with brown; ovipositor sheath about 2.0 as long as the forewing.*

Female: Forewing about 11.5 mm. long; as seen from above, head about 0.75 as long as wide; top of head somewhat shining, with fine rather close punctures; lateral lobe of mesoscutum weakly

wrinkled all over; temple strongly convex, fuller than in *A. foxleei*; ovipositor sheath about 2.0 as long as the forewing. Otherwise structurally similar to *A. foxleei*.

Colored about as in *A. foxleei* except that there is no blackish triangle between the eye and the lateral ocellus.

Male: Similar to the male of *A. occidentalis* but the temple slightly fuller, the abdomen a little more elongate, and the thorax with fulvous marking as follows: a spot on scutellum, much of propleurum, and an anterior and a posterior stripe on side of pronotum. The male sex is known only from the type of *consors*, and may be distinguished from that of *occidentalis* and of *foxleei* only with care and experience.

Kieffer's name *ferrugineus* was proposed for the species described by Schletterer (Ann. Naturh. Mus. Wien, vol. 4, p. 537, 1889) as *Aulacus melleus* Cresson. The description is of a female from Nevada, 15 mm. long and with an ovipositor 21 mm. long. Among the species corresponding to the color description given, this ovipositor length is found only in the true *melleus* of Cresson.

*Specimens*.—♀, Carrville, Trinity County, Calif., 2,400–2,500 feet, June 10, 1934 (Townes). 2 ♀, Lake Tahoe, Calif., August 21, 1915, 6,200 feet (Ithaca and Townes). ♀, Meyers, Calif., July 25, 1916, F. B. Herbert (Washington). ♀, Weed, Calif., August 1915, W. J. Chamberlin (Cambridge). ♀, Lake O Woods, Klamath County, Oreg., 4,950 feet, August 12, 1935, G. Ferguson (Corvallis). ♀, 8 miles west of Paulina Lake, Oreg., July 26, 1939, Schuh and Gray (Townes).

A female from Union City, Wash., August 11, 1908, J. C. Bradley (Ithaca), has the ovipositor sheath only 1.4 as long as the forewing but otherwise seems typical of the species. It may, however, belong to *A. occidentalis*.

#### 17. AULACOSTETHUS FOXLEEI, new species

FIGURES 15, *i*; 16, *j*

*Wings strongly suffused with brown; temple moderately convex, not so full as in A. occidentalis and A. melleus; top of female head ferruginous with a blackish triangle pointing inward from the top of the eye (fig. 16, j).*

Forewing about 11 mm. long; as seen from above, head about 0.8 as long as wide; frons with very close, medium sized punctures, and medially usually with some fine rugosity; top of head rather dull, with fine close punctures; temple moderately convex (fig. 16, *j*), not as full as in *A. occidentalis* and *A. melleus*; occipital carina about 0.3 as high as the diameter of the first flagellar segment, slightly reflexed; propleurum without distinct punctures; pronotum with some coarse wrinkling and small, rather indistinct punctures, its anterior edge without a projecting tooth; lateral lobe of mesoscutum smooth and polished

anteriorly, posteriorly usually with some weak wrinkling and punctures; upper surface of hind coxa smooth and polished; tarsal claws each with three teeth; ovipositor sheath about 1.4 as long as the forewing.

Female: Ferruginous. An oblique blackish triangle projecting inward and backward from the eye toward the lateral ocellus (fig. 16, *j*); labial palpus and maxillary palpus, especially basally, infuscate; flagellum blackish; thorax often with small infuscate areas on the inner part of the lateral lobe of the mesoscutum, on the sterna, and sometimes elsewhere; wings heavily tinged with reddish brown, the forewing darker at the apex and with a large conspicuous dark brown mark below the stigma (fig. 15, *i*).

Male: Colored like the female except as follows: Head largely to entirely black; pedicel blackish; thorax largely to almost entirely black, but always with at least the median lobe of the mesoscutum partly ferruginous laterally; middle and hind coxae more or less extensively blackish basally; usually a dorsal basal stripe on first tergite, a subapical triangle on each side of second tergite, fourth tergite dorsally, fifth tergite except ventrally, and most or all of sixth and seventh tergites black. The apical and substigmal wing marks are somewhat smaller and weaker than in the female.

Type: U. S. N. M. No. 58825, ♀, Kooskooskie, near Walla Walla, Wash., July 15, 1932, M. C. Lane (Washington).

Paratypes: 18 ♂, 27 ♀, from BRITISH COLUMBIA (Hundred Mile House, Robson, and Wellington); CALIFORNIA (Big Flat on Coffee Creek in Trinity County and Carrville in Trinity County at 2,400 to 2,500 feet); IDAHO (Post Falls and Priest River Lake); MONTANA (Missoula); OREGON (Cascadia, Lucky Boy Camp on the Blue River, Parkdale, Suttle Lake at 3,435 feet, and Triangle Lake in Lake County); and WASHINGTON (Blue Mountains, Dayton, Kooskooskie near Walla Walla, Mill Creek near Walla Walla, and Wolf Fork on the Touche River). Dates of capture are distributed from June 10 to September 1. A female from Priest River Lake, Idaho, was taken while flying about *Pinus contorta*. Two other specimens were reared as follows: ♂, from *Leptura obliterata* in *Pinus ponderosa*, Missoula, Mont., June 10, 1914, H. B. Kirk; ♀, from *Pinus ponderosa* infested with *Leptura obliterata*, *L. plagifera*, and *Anoploclera sanguinea*, Priest River Lake, Idaho, July 20, 1902, A. D. Hopkins.

This species occurs in British Columbia and the Northwestern United States. It parasitizes lepturine cerambycids in *Pinus*. Records indicate that it occurs often at lower altitudes than does the similar appearing *Aulacostethus occidentalis*. The specific name is proposed in honor of H. R. Foxlee, who collected a number of specimens at Robson, British Columbia, and whose other collections have been doing much to make known the insect fauna of that vicinity.



18. *AULACOSTETHUS BILOBATUS* (Provancher), new combination

*Aulacus bilobatus* PROVANCHER, Nat. Can., vol. 10, p. 237, 1878; Faune p. 247.

Type: ♂, Quebec (Quebec).

*Tarsal claws each with two teeth; propleurum punctate; apical half of ♀ abdomen black.*

Forewing about 8 mm. long; frons with small close punctures, medially the punctures sparse; top of head with moderately close, fine punctures, separated by about 0.5 the length of their setae; propleurum with moderately close, weak, medium-sized punctures; pronotum wrinkled, somewhat rugosopunctate around the edges; hind coxa above finely transversely rugosopunctate or wrinkled; ovipositor sheath about 1.5 as long as the forewing. Other structural features as in *A. rufitarsis*.

Black. Fore and middle tibiae and tarsi and hind tarsi brownish; fore and middle femora more or less tinged with brown; abdomen ferruginous, its apical half and base of first tergite black. In males the abdomen is often mostly black, with only the first two tergites largely ferruginous.

*Specimens.*—Many males and females from MICHIGAN (Point Abaye); NEW HAMPSHIRE (Durham); NEW JERSEY (Alpine); NEW YORK (Greene County, Ithaca, and Slaterville); NOVA SCOTIA; NORTH CAROLINA (Tryon); OHIO (Cleveland and Mentor); ONTARIO (Footes Bay, Ottawa, and Waubanic); PENNSYLVANIA (Hummelstown and Hunters Run); WEST VIRGINIA (Cairo); and WISCONSIN (Menominee Indian Reservation and Neopit). Dates of capture are rather evenly distributed from June 14 to August 13, with four records from May 13 to May 22, apparently from indoor rearings. Records from eight localities state that the specimens were reared from *Tsuga canadensis*, and from two additional localities that the specimens were collected on this tree. Six of the eight rearing records give the host as *Melanophila fulvoguttata* (Buprestidae), one as *Melanophila*, and the remaining record as "hemlock borer."

This species is parasitic on *Melanophila fulvoguttata* (Buprestidae) infesting *Tsuga canadensis* and seems to have the same range as this tree. It has been collected from Nova Scotia to North Carolina and west to Wisconsin.

19. *AULACOSTETHUS RUFITARSIS* (Cresson), new combination

*Aulacus rufitarsis* CRESSON, Proc. Ent. Soc. Philadelphia, vol. 3, p. 134, 1864.

Type: ♀, Colorado (Philadelphia).

*Aulacus abdominalis* CRESSON, Trans. Amer. Ent. Soc., vol. 8, proc. v, 1880.

Type: ♀, Georgia (lost).

*Aulacus erythrogaster* KIEFFER, Arkiv Zool., vol. 1, p. 561, 1904. Types: ♂ ♀, Nevada (Stockholm).

*Odontaulacus spinosipes* KIEFFER, Ann. Soc. Ent. France, vol. 79, p. 79, 1910.

Type: ♀, Salida, Colo. (Claremont, Calif.). (New synonymy.)

*Tarsal claws each with two teeth; hind femur blackish; propleurum not distinctly punctate.*

Forewing about 8.0 mm. long; as seen from above, head about 0.7 as long as wide; frons with small, rather close punctures, sparser medially and dorsally; top of head with sparse, fine punctures, which are separated by about the length of their setae; temple strongly convex, rather short; occipital carina sharp, not produced; propleurum with moderately sparse indistinct punctures, or not distinctly punctate; pronotum coarsely wrinkled, somewhat rugosopunctate around the edges, without a projecting tooth on its front edge; mesoscutum rather strongly and angularly bulging forward, above with heavy transverse ridges; hind coxa above weakly and moderately coarsely rugosopunctate; tarsal claws each with two teeth, a median low but rather strong tooth and a subbasal low weak tooth; ovipositor sheath about 1.35 as long as the forewing.

Black. Clypeus and scape brown to blackish, usually palest in males; fore and middle legs beyond coxae blackish to fulvous; hind legs beyond coxa black to dark brown, its tarsus stramineous to light brown; wings hyaline to somewhat infuscate, without spots; abdomen red, the base of the first tergite and the apical tergites of the male (beginning usually with the fifth) black.

*Specimens.*—Many males and females from ALBERTA (Banff); ARIZONA (Cochise County, Flagstaff, Santa Catalina Mountains, and Williams); CALIFORNIA (Carrville at 2,400 to 2,500 feet, Colfax, Fallen Leaf Lake, Fresno County at 7,000 feet, Huntington Lake, Inyo County, Mammoth Lake, McCloud, Mineralking, Mount Lassen, Paonia, Phillips Station, Placerville, Pyramid Ranger Station, Sequoia National Park at 6,000–7,000 feet, Shasta Springs, Summerdale, Tejon Pass, and Truckee); COLORADO (Florissant and North Cheyenne Canyon); IDAHO (Priest River Lake, Salmon, and Wallace); MAINE (Bar Harbor, Ellsworth, Medomak, and Mount Desert); MANITOBA (Husavick); MARYLAND (Takoma Park); MASSACHUSETTS (Amherst); MICHIGAN (Cheboygan County, Point Abaye, and Whitefish Point); MINNESOTA (Itasca, Itasca Park, and Lake Itasca); MONTANA (Glacier National Park and Helena); NEW HAMPSHIRE (Jaffrey and Waterville); NEW MEXICO (Beulah at 8,000 feet, Cox Canyon in the Sacramento Mountains at 9,300 feet, and Santa Fe County); NEW YORK (Clinton County, Danby, and Ithaca); NORTH CAROLINA (Bent Creek at Asheville); ONTARIO (Sudbury); OREGON (Crater Lake, Diamond Lake in Douglas County at 5,182 feet, near Halfway, and Wallowa Mountains at 6,000 feet); PENNSYLVANIA (Charter Oak, Drumgold, and Endeavor); QUEBEC (Fort Coulonge and Laniel); VERMONT (Jacksonville); WASHINGTON (Easton); and WYOMING (Grand Teton National Park). Dates of collections are distributed from June 1 to August 25, with three records in September as follows: September 12 and 13 at Banff, Alberta, and September 18 at Colfax, Calif. Reared specimens include: ♂, from *Chrysobothris*

"*caurina*" in *Pinus ponderosa*, Placerville, Calif., June 2, 1915, H. E. Burke; 2 ♂ ♀, from *Melanophila fulvoguttata* in *Tsuga canadensis*, Waterville, N. H., 1906, A. D. Hopkins; ♀, from *Melanophila drummondii* in *Abies concolor*, Pyramid Ranger Station, Calif., August 3, 1915, F. B. Herbert; and 3 ♀, from *Saperda calcarata* in *Populus tremuloides*, North Cheyenne Canyon, Colo., George Hofer. Additional records associate the species with *Pinus arizonica* and *Tsuga mertensiana*.

This species is transcontinental in the Canadian and Transition Zones. The usual hosts are buprestids in conifers.

20. *AULACOSTETHUS EDITUS* (Cresson), new combination

*Aulacus editus* CRESSON, Trans. Amer. Ent. Soc., vol. 8, proc. v, 1880. Type: ♀, Nevada (Philadelphia).

*Tarsal claws each with two teeth; hind femur ferruginous; hind tibia concolorous with its femur and tarsus.*

Forewing about 8.5 mm. long; frons with moderately small rather close punctures; top of head with moderately close, fine punctures which are separated by about 0.5 the length of their setae; ovipositor sheath about 1.25 as long as the forewing. Otherwise structurally similar to *A. rufitarsis*.

Female: Black. Clypeus and scape brown to black; legs beyond coxae brownish ferruginous, the hind ones darkest; first trochanters, especially the hind ones, more or less infuscate; second trochanters slightly darker than their femora; wings very weakly tinged with yellowish brown; abdomen red, the base of the first tergite black.

Male: Colored like the female except that the clypeus and scape average paler, the fore and middle coxae and trochanters are usually brownish ferruginous, the hind coxa often brownish ferruginous apically, and the apical tergites, beginning usually with the fifth, are black.

*Specimens*.—9 ♂, 69 ♀, from BRITISH COLUMBIA (Courtenay, Goldstream, Kamloops, Maple Bay on Vancouver Island, Midday Valley at Merritt, Pender Harbor, Robson, Seton Lake, Steelhead, Stone Lake, Trinity Valley at Lumby, Vancouver, and Victoria); CALIFORNIA (Alpine, Big Basin in the Santa Cruz Mountains, Boulder Creek, Copper, Del Norte, Glacier Point, and Mineralking); IDAHO (Priest Lake); OREGON (Alsea, Alsea Mountain, Antelope Mountain in Harney County at 6,500 feet, Corvallis, Lucky Boy Camp on the Blue River, Oregon Trail Camp in Whitman National Forest at 5,000 feet, Parksdale, 2 miles west of Paulina Lake, Peoria in Benton County, Pole Bridge Meadows in Crater Lake Park at 6,500 feet, Portland, Rickreall, Summit Prairie, and Woodruff Meadows in Jackson County); and WASHINGTON (Ashford, Elbe, Metaline Falls, Mount Rainier at 4,700 feet, and Orcus Island). Most of the collec-

tion dates are in July and August. Those outside these months are May 1 at Corvallis, Oreg.; June 14 in the Santa Cruz Mountains of California; and June 20 at Alpine, Calif. Also there are rearing dates noted below. Reared specimens comprise: ♂, from *Trachykele blondeli* gallery in *Thuja plicata*, Stone Lake, British Columbia, July 28, 1925, N. L. Cutler; ♂, ♀, from *Paratimia conicola* in cones of *Pinus attenuata*, Copper, Calif., September 15, 1916, P. D. Sargent; ♂, from *Paratimia conicola* in cones of *Pinus attenuata*, Del Norte, Calif., October 2, 1913, P. D. Sargent; 2 ♂, reared from cone of *Pinus attenuata* perhaps as parasites of *Chrysophana placida* or *Paratimia conicola*, Boulder Creek, Calif.; 2 ♀, from *Chrysophana placida* in cones of *Pinus attenuata*, Orcus Island, Wash., July 14 to 30, 1909, W. M. Mann.

This species occurs in British Columbia and the Northwestern United States. Its usual hosts are buprestids and cerambycids in pine cones.

21. AULACOSTETHUS MINOR (Cresson), new combination

*Aulacus minor* CRESSON, Trans. Amer. Ent. Soc., vol. 8, proc. vi, 1880.

Type: ♀, Nevada (Philadelphia).

*Tarsal claws each with two teeth; hind femur ferruginous; hind tibia distinctly darker than its femur and tarsus.*

Forewing about 7.5 mm. long; top of head usually a little more shining than in *A. editus*; wings weakly infumate; otherwise similar to *A. editus* in color and structure except as noted in the key.

*Specimens.*—Many males and females from BRITISH COLUMBIA (Castlegar Mills, Inverness, Midday Valley at Merritt, Nanaimo Biological Station, Pavilion Lake, Paxton Valley, Revelstoke in the Selkirk Mountains, Robson, Trinity Valley at Lumby, and Victoria); CALIFORNIA (Blocksburg, Carrville in Trinity County at 2,400 to 2,500 feet, Colfax, Fallen Leaf Lake at 6,300 feet, Fort Seward, Hedge Creek Canyon in the Siskiyou Mountains, Humboldt County, Los Gatos, Meyers, Mineralking, Mosquito, North Fork, Placerville, Pyramid Ranger Station, Santa Cruz Mountains, Shasta Springs, Trinity County at 6,000 feet and at 5,500 feet, and Yosemite at 3,880 to 4,000 feet); IDAHO (Hartley, McCall, Moscow, Salmon, and Wallace); MONTANA (Lake Roman in Lake County); OREGON (Alsea, Alsea Mountain, Antelope Mountain in Harney County at 6,500 feet, Ashland, Black Trail Springs near Elk Lake in Deschutes County at 5,000 feet, Corvallis, Glenwood, Grant County, Lincoln Mountain at Milton, near summit of Marys Peak in Benton County, Melhorn's Mill near Halfway, Oakridge, Oregon Trail Camp in Whitman National Forest at 5,000 feet, Portland, Sandy River at Brightwood, Santiam Pass in Linn County, Sulphur Springs in Benton County, Suttle Lake at 3,435 feet, and Wallowa Mountains in Baker County); UTAH (Kamas); WASHINGTON (Blue Mountains, Buckeye, Chinook

Pass, Easton, Elbe, Hoquiam, Kent, Metaline Falls, Mount Baker at Skyline Ridge, and Mount Rainier at 4,700 feet and at Alta Vista); and WYOMING (Yellowstone Park). Dates of collection are mostly in June, July, and early August, but a number of others show the usual flight period is from about May 23 to August 20, and there are a few dates outside this period as follows: May 22 in Trinity County, Calif.; August 26 at Chinook Pass, Wash.; September 3 in Trinity Valley, British Columbia, and September 4 at Castlegar Mills, British Columbia. There are about 22 definite associations of this parasite species with a host, mostly in rearings made by the U. S. Division of Forest Insect Investigations. Eleven different rearings are from *Melanophila drummondi* in *Pseudotsuga taxifolia*, nine others from *Melanophila drummondi* in *Abies concolor*, *A. magnifica*, *Picea sitkensis*, and *Tsuga heterophylla*. One rearing is from *Melanophila intrusa* in *Pinus ponderosa* and another from *Hylotrupes ligneus* in *Abies*.

This species occurs in British Columbia and the Northwestern United States. Its usual host is *Melanophila drummondi* (Buprestidae) in *Pseudotsuga taxifolia* and other conifers. Other hosts are *Melanophila intrusa* and *Hylotrupes ligneus* (Cerambycidae), also in conifers.

#### Genus AULACUS Jurine

*Aulacus* JURINE, Nouvelle méthode de classer les hyménoptères et les diptères, p. 89, 1807. Type: *Aulacus striatus* Jurine. Monobasic.

*Aulacinus* WESTWOOD, Trans. Ent. Soc. London, 1868, p. 331, 1869. Type: *Aulacus (Aulacinus) moerens* Westwood. Monobasic. (New synonymy.)

*Pammegischia* PROVANCHER, Nat. Can., vol. 13, p. 302, 1882. Type: *Pammegischia burquei* Provancher. Monobasic.

?*Parafoenus* KIEFFER, Bull. Soc. Ent. France, 1910, p. 350. Type: *Parafoenus formosus* Kieffer; first species included (by Kieffer, 1911). (New synonymy.)

*Neuraulacinus* KIEFFER, Bull. Soc. Ent. France, 1910, p. 350. Type: *Neuraulacinus braconiformis* Kieffer; first species included (by Kieffer, 1911). New synonymy.)

*Micraulacinus* KIEFFER, Bull. Soc. Ent. France, 1910, p. 350. Type: *Micraulacinus elegans* Kieffer; first species included (by Kieffer, 1911). (New synonymy.)

*Pycnaulacus* CUSHMAN, Proc. U. S. Nat. Mus., vol. 76, art. 25, p. 17, 1929. Type: *Pycnaulacus brevicaudus* Cushman; original designation.

The genus contains a diverse set of species. In the Nearctic Region, the species *dispilus* and *brevicaudus* are not closely related to each other or to the rest, while *pallipes*, *lovei*, *burquei*, and *digitalis* form a very distinct, compact group which includes also the European *A. striatus* Jurine, 1807. Since *striatus* is the genotype of *Aulacus*, these five constitute *Aulacus* in the strict sense and may be recognized as a subgenus whenever anyone secures enough of the species of the world to attempt a subgeneric division. The characters of this group are pointed out in the first couplet of the key and are not repeated in the species descriptions; its species are often difficult to distinguish.

## KEY TO THE NEARCTIC SPECIES OF AULACUS

1. Top of head without wrinkles; back of head without wrinkles in position of occipital carina; hind coxa of female without a projecting ventral lobe; first sternite of female not cleft; parasites of Coleoptera..... 2  
 Top of head anteriorly with transverse wrinkles; back of head with concentric wrinkles in position of occipital carina; hind coxa of female with a ventral lobe projecting well beyond trochanter socket; first sternite of female cleft more than halfway to base; parasites of *Xiphydria*..... 3
2. Forewing with an apical dark spot; frons coarsely punctate; head and thorax ferruginous..... 1. *dispilus*, new species  
 Forewing without an apical dark spot; frons very finely punctate; head and thorax black..... 2. *brevicaudus* Cushman
3. Reticulate or transverse wrinkling of frons extending almost to median ocellus; sides of pronotum with some coarse rugosities in addition to finer rugosities and some punctation; apical part of abdomen usually black; temple often black..... 3. *pallipes* Cresson  
 Reticulate or transverse wrinkling of frons confined mostly to its anterior portion, rarely extending close to median ocellus; sides of pronotum punctate and partly finely rugose; apical part of abdomen pale, rarely blackish; temple pale..... 4
4. Apical process of female hind coxa more than 1.4 as long as wide; mesoscutum black; sculpture on upper part of frons more or less as in figure 16, *m*.  
 5. *digitalis*, new species  
 Apical process of female hind coxa less than 1.4 as long as wide; mesoscutum usually pale; sculpture on upper part of frons more or less as in figure 16, *l, n*..... 5
5. Hind femur about 5.0 as long as wide; frons smoother and more distinctly punctate, without an anterior fine longitudinal wrinkle or group of wrinkles (fig. 16, *l*); second cubital cell receiving the second recurrent vein usually well beyond its middle; ovipositor sheath about 0.5 as long as forewing.  
 4. *lovei* Ashmead  
 Hind femur about 6.0 as long as wide; frons averaging more wrinkled and less distinctly punctate, usually with an anterior median fine longitudinal wrinkle, or group of wrinkles (fig. 16, *n*); second cubital cell receiving the second recurrent vein at or a little beyond its middle; ovipositor sheath about 0.74 as long as the forewing..... 6. *burquei* Provaneher

## 1. AULACUS DISPILUS, new species

*Forewing with an apical dark spot.*

Type female: Forewing 5.3 mm. long; frons with coarse, rather close punctures; top of head with coarse, rather distant punctures; inner side of hind coxa with an oblique channel ending below on a prominence which is a little beyond the midlength of the coxa; ovipositor sheath 1.1 as long as the forewing.

Ferruginous. Flagellum blackish; pronotum brown; coxae, basal trochanters, hind femur, thoracic sterna, lower part of metapleurum and blotches behind the bases of the wings and on the propodeum below the attachment of the abdomen dark brown; second trochanters and fore and middle femora basally more or less light brown; hind tibia brown, its basal 0.25 stramineous; forewing dark brown beyond

the middle of the radial cell, and with a light brown area under the stigma (wings entirely hyaline in the other Nearctic species of *Aulacus*); abdomen light brown, the basal part of the first tergite whitish and a moderately broad band at the juncture of the second and third tergites stramineous; ovipositor sheath with a broad whitish preapical band.

Type: U. S. N. M. No. 58827, ♀, Brownsville, Tex., March 20, 1908, Jones and Pratt (Washington).

## 2. *AULACUS BREVICAUDUS* (Cushman), new combination

*Pycnaulacus brevicaudus* CUSHMAN, Proc. U. S. Nat. Mus., vol. 76, art. 25, p. 18, 1929. Type: ♀, Palo Alto, Calif. (Washington).

*Frons and top of head smooth, with fine punctures.*

Forewing about 5.3 mm. long; frons and top of head smooth with very fine punctures; inner side of hind coxa of female without a channel; ovipositor sheath about 0.6 as long as the forewing.

Black. Scape ferruginous; pedicel more or less ferruginous; clypeus dark brown; mandible largely light brown; palpi brown; legs beyond coxae ferruginous; wings hyaline; abdomen ferruginous, the base of the first tergite blackish and each tergite with a transverse apical fuscous band, darker on the apical tergites and weak or absent on the basal ones, in the female the apical 0.4 of abdomen more or less infusate.

*Specimens*.—♂, Berkeley, Calif., May 20, 1935, coll. Bohart (Townes). ♂, ♀, Cazadero, Sonoma County, Calif., May 1935, coll. Bohart (Bohart and Townes). ♂, Felton, Santa Cruz Mountains, 300 to 500 feet, Calif., May 15 to 19, 1907, J. C. Bradley (Ithaca). ♀, Huntington Lake, Fresno County, 7,000 feet, Calif., July 7, 1919, E. P. Van Duzee (San Francisco). ♂, Lake County, Calif. (Washington). ♂, Piedmont, Alameda County, Calif., June 25, 1905 (Ithaca). ♂, Potwisha, Sequoia National Park, 2,000 to 5,000 feet, Calif., June 2, 1929, E. C. Van Dyke (San Francisco). ♀, reared from *Salix* twigs bearing *Euura* galls, Ashland, Oreg., B. T. Harvey (Washington). ♀, reared from *Alnus rhombifolia*, Ashland, Oreg., April 24, 1915, B. T. Harvey (Washington).

Known only from Oregon and California.

## 3. *AULACUS PALLIPES* Cresson

FIGURE 16, k

*Aulacus pallipes* CRESSON, Trans Amer. Ent. Soc., vol. 7, proc. xvii, 1879.

Type: ♂, Massachusetts (Philadelphia).

*Pammegischia xiphydriæ* ASHMEAD, Can. Ent., vol. 33, p. 300, 1901. Type: ♀, Saranac Inn, N. Y., ex *Xiphydria provancheri* (Washington). (New synonymy).

*Pammegischia weedi* ASHMEAD, Can. Ent., vol. 33, p. 301, 1901. Type: ♂, Hanover, N. H. (Washington). (New synonymy.)

*Pammegischia ashmeadi* BRADLEY, Trans Amer. Ent. Soc., vol. 34, p. 122, 1908, Type: ♀, Montreal, Quebec (Ithaca). (New synonymy.)

*Pammegischia minnesotae* BRADLEY, Trans. Amer. Ent. Soc., vol. 34, p. 122, 1908.

Type: ♂, Lake Vermillion, Minn. (Washington). (New synonymy.)

*Wrinkling of frons extending almost to median ocellus; apical part of abdomen usually dark.*

Female: Forewing about 6.0 mm. long; sculpture of frons approximately as in figure 16, *k*, more extensively wrinkled than in other species, the wrinkles transverse or often tending to limit transverse rectangles as in figure 16, *k*; third flagellar segment about 4.2 as long as wide; pronotum strongly rugose, with some punctures; dorsal face of propodeum strongly declivous anteriorly; process on hind coxa about 1.3 as long as wide; hind femur about 5.0 as long as wide; abdomen about 2.4 as long as wide; ovipositor sheath about 1.0 as long as forewing.

Coloration variable, usually as follows: Black. Clypeus, mandibles except apex, and palpi brown; legs dark brown, the front legs paler, and the tarsi and ends of tibiae yellowish brown; abdomen ferruginous, the basal part of the first segment black and the apical  $0.35 \pm$  of abdomen blackish. Frequently the temple and prothorax are dark brown rather than black. One specimen before me is entirely fulvous, and there are numerous intergrades between this and the darker typical form.

Male: Similar to the female, but a little more slender; the frons a little less completely and strongly wrinkled; the third flagellar segment about 6.0 as long as wide; the face, cheek, and underside of scape fulvous; and the legs beyond coxae usually fulvous.

This species is very close to the European *A. striatus* Jurine, 1807.

*Specimens.*—22♂, 62♀, from BRITISH COLUMBIA (Restmore in Hunters County and Salmon Arm); IDAHO (Stiles); MANITOBA (Aweme); MASSACHUSETTS (Petersham and West Summit near North Adams); MICHIGAN (Ontonagon County); MISSOURI (St. Louis); MONTANA (Jefferson Island); NEW BRUNSWICK (St. Andrews); NEW YORK (Cranberry Lake and New York); ONTARIO (Ottawa); PENNSYLVANIA (Inglenook and Rockville); QUEBEC (Knowlton, Pentecost, and Quebec); RHODE ISLAND (Westerly); and WASHINGTON (Metaline Falls). Collection dates are mostly in July and range from June 10 to August 9. There are a number of reared lots. Two of them are from *Betula lutea*, one from *Betula nigra*, and six more give the host tree as *Betula* sp. Three of these rearings from *Betula* spp. give the host insect as *Xiphydria* sp., and two others record the host insect as *Xiphydria mellipes* without stating the host tree.

This species is transcontinental in southern Canada and the northern part of the United States. It parasitizes *Xiphydria* in *Betula* spp.



## 4. AULACUS LOVEI (Ashmead)

FIGURE 16, l

*Pammegischia Lovei* ASHMEAD, Can. Ent., vol. 33, p. 301, 1901. Type: ♀, Palisades, N. J. (Washington).

*Pammegischia ouelletii* BRADLEY, Trans. Amer. Ent. Soc., vol. 27, p. 329, 1901. Type: ♂, Joliette, Quebec (Ithaca). (New synonymy.)

*Wrinkling of frons about as in figure 16, l; hind femur about 5.0 as long as wide.*

Female: Forewing about 5.5 mm. long; sculpture of frons approximately as in figure 16, l; upper part of head a little more inflated than in related species; third flagellar segment about 4.8 as long as wide; pronotum partly punctate and partly rugose; dorsal surface of propodeum moderately declivous anteriorly; second cubital cell receiving the second recurrent vein usually well beyond its middle (in related species received usually at or a little beyond its middle); process on hind coxa about 1.1 as long as wide; hind femur about 5.0 as long as wide; abdomen about 2.3 as long as wide; ovipositor sheath about 0.55 as long as the forewing.

Coloration variable, ranging from a uniform brownish ferruginous through various shades and extents of brown additions to specimens which are colored as follows: Head light brown, its top and back dark brown; scape light brown, the rest of the antenna dark brown; thorax dark brown, blackish in some places, especially posteriorly; coxae, femora, and first trochanters brown, those of the hind legs darkest and of the front legs palest; second trochanters and ends of femora pale; tarsi and front and middle tibiae brownish stramineous; hind tibia brown, pale at the ends; abdomen fulvous, the base of the first tergite black.

Male: Similar to the female but a little more slender; the wrinkles on the frons a little weaker and less extensive; the third flagellar segment about 8.4 as long as wide; and the face, cheek, and most of the pronotum always stramineous or pale fulvous.

*Specimens.*—3 ♂, 2 ♀, reared from *Xiphydria tibialis* in *Betula*, College Park, Md., 1942, W. H. Anderson (Washington). ♂, reared from host in *Carpinus caroliniana*, Plummers Island, Md., June 21, 1916, T. E. Snyder (Washington). ♀, reared from *Carpinus*, Plummers Island, Md., August 17, 1907 (Washington). ♀, Plummers Island, Md., August 29, 1912, H. L. Viereck (Washington). 2 ♀, Monterey, Mass., July 10 and 14, 1923, C. A. Frost (Cambridge). ♀, Anglesea, N. J. (Washington). ♀, reared from host in *Tilia*, Bear Mountain, N. Y., June 21, 1925, F. M. Schott (Dreisbach). ♀, between Caroline and Hartford, N. Y., June 15, 1904 (Ithaca). ♀, McLean Bogs, Tompkins County, N. Y., July 22, 1939, J. G. Franclemont (Townes). ♀, West Point, N. Y., June 7, 1925, W. Robinson

(Washington). ♂, reared from host in *Tilia americana*, Clarks Valley, Pa., J. N. Knull (Washington). 7 ♂, 17 ♀, Harrisburg, Pa., 1921, A. B. Champlain (Washington). ♂, reared from host in *Carpinus*, Harrisburg, Pa., 1921, Champlain and Knull (Washington). ♂, 2 ♀, reared from *Xiphydria* in *Tilia*, Harrisburg, Pa., May 19 and 23, 1913, A. B. Champlain (Washington). ♂, reared from *Xiphydria attenuata* in *Tilia americana*, Harrisburg, Pa. (Washington). ♀, Spring Brook, Pa., May 27, 1945, H. K. Townes (Washington). ♀, Plainfield, Vt., June 21, 1941, R. H. McCauley (Townes).

This species occurs in the Transition Zone from Quebec to Maryland. It parasitizes *Xiphydria*, usually in *Tilia* and *Carpinus*.

##### 5. AULACUS DIGITALIS, new species

###### FIGURE 16, m

*Process on female hind coxa not less than 1.4 as long as wide.*

Female: Forewing about 6.5 as long as wide; sculpture of frons approximately as in figure 16, m, rather concentrated in a transverse band and usually more irregular and more punctate than in related species; third flagellar segment about 5.3 as long as wide; pronotum partly punctate and partly rugose; dorsal face of propodeum strongly declivous anteriorly; process on hind coxa about 1.7 as long as wide; hind femur about 5.0 as long as wide; abdomen about 2.7 as long as wide; ovipositor sheath about 0.90 as long as the forewing.

Head medium brown, darker above and behind; face, cheeks, mandible except apical part, and scape brownish stramineous; thorax dark brown or blackish; legs light brown to blackish brown, the second trochanters, extreme ends of femora, tarsi, fore and middle tibiae, and ends of hind tibia stramineous to pale brown; abdomen ferruginous, the first segment black basally. One specimen has the abdomen mostly blackish brown above except for broad transverse ferruginous bands centering on the first and second incisures.

Male: Similar to the female but a little more slender; the sculpture of the frons a little weaker and more restricted; the third flagellar segment about 8.0 as long as wide; and colored as follows: Head fulvous, brown above and with the face and cheeks stramineous; mandibles except apically, palpi, and scape brownish stramineous; flagellum blackish basally, shading to pale brown apically; thorax blackish brown, the propleurum, pronotum except dorsally, and more or less of the mesosternum brownish stramineous; legs brownish stramineous, the hind coxa brown and the middle coxa often light brown; abdomen ferruginous, the basal part of the first segment blackish.

Type: U. S. N. M. No. 58828, ♀, emerged from dead wood, Putnam, Conn., May 7, 1913, H. B. Kirk (Washington).

Paratypes: 2 ♀, reared from *Xiphydria maculata* in *Acer saccharinum*, Lyme, Conn., 1918, A. B. Champlain (Washington). ♀ (reared), Putnam, Conn., May 7, 1913, H. B. Kirk (Washington). ♂, reared from host in *Malus pumila*, Wallingford, Conn., April 2, 1913, D. J. Caffrey (Washington). ♂, ♀, reared from host in dead *Acer*, Wallingford, Conn., May 1, 1913, D. J. Caffrey (Townes). ♂, Petersham, Mass. (Cambridge). 2 ♀, Petersham, Mass., July 17 (Cambridge and Townes). ♀, North Bass Island at Put in Bay, Ohio, June 20 to 30, C. H. Kennedy (Columbus). ♀, Rockville, Pa., April 5, 1912, W. S. Fisher (Washington). ♀, reared from host in *Acer saccharum*, Morgantown, W. Va., May 24, 1897 (Ithaca).

This species is in the Transition Zone of the Northeastern United States. It parasitizes *Xiphydria* in *Acer*, and there is one rearing record from *Malus*.

#### 6. AULACUS BURQUEI (Provancher)

FIGURE 16, n

*Pammegischia Burquei* PROVANCHER, Nat. Can., vol. 13, p. 303, 1882; Faune p. 752. Type: ♀, St. Hyacinthe, Quebec (Quebec).

*Body entirely light reddish buff; hind femur about 6.0 as long as wide.*

Female: Forewing about 7.5 mm. long; sculpture of frons approximately as in figure 16, n, rather restricted to a forward area and usually with an anterior median fine longitudinal wrinkle or group of wrinkles; third flagellar segment about 6.0 as long as wide; pronotum polished, with some punctures and rather weak rugae; dorsal surface of propodeum moderately declivous anteriorly; process on hind coxa about 1.2 as long as wide; hind femur about 6.0 as long as wide; abdomen about 2.8 as long as wide; ovipositor sheath about 0.74 as long as the forewing.

Light reddish buff, the pedicel and flagellum brown.

Male: Similar to the female but a little more slender, the sculpture of the frons a little weaker and more restricted; the third flagellar segment about 0.72 as long as wide; the coloration a little paler, and the flagellum brown only basally.

*Specimens.* ♂, Monmouth, Maine, June 20, 1927, C. A. Frost (Cambridge). 18 ♂, 6 ♀, reared from *Xiphydria* in *Acer*, Plummers Island, Md., 1913, T. E. Snyder, H. S. Barber, and S. A. Rohwer (Washington). ♀, Midland County, Mich., June 24, 1945, R. R. Dreisbach (Dreisbach). 2 ♀, collected while ovipositing in *Acer*, Pinkham Notch, N. H., June 25, 1938, H. and M. Townes (Townes). ♀, Ithaca, N. Y., June 17, 1920 (Ithaca). ♂, McLean Bogs, Tompkins County, N. Y., June 30, 1921 (Ithaca). ♀, Nassau, N. Y., July 4, 1905 (Ithaca). ♂, Baddeck, Nova Scotia, June 26, 1936, J. McDunnough (Ottawa). ♂, ♀, Burke Falls, Ontario, July 12 and

16, 1926, F. P. Ide (Ottawa). ♀, reared from *Xiphydria maculata* in *Acer*, Lemoyne, Pa., May 21, A. B. Champlain (Washington). 2 ♀, Hemmingford, Quebec, August 6, 1925, T. Armstrong (Ottawa). ♂, Montreal, Quebec, July 16, 1925, L. Daviault (Ottawa). ♀, locality illegible, July 5, 1910, M. C. Van Duzee (San Francisco).

This species occurs from Quebec south to Pennsylvania and west to Michigan. It parasitizes *Xiphydria* in *Acer*.

### Subfamily GASTERUPTIINAE

The gasteruptiines are usually collected on flowers, especially those of Umbelliferae, or while in exploring flights around stumps, logs, and posts in which hosts may nest. All are parasites in the nests of Apoidea and Sphecoidea nesting in wood or in twigs. There are no reports on biological observations in North America.

The Nearctic species of the subfamily may be divided into two groups that may as well be considered genera. One of these (*Gasteruption*) is rather small, compact, and mostly Holarctic in distribution. The other (*Rhydinofoenus*) is a large genus of world-wide distribution. In spite of its size and a considerable diversity in its species, it is difficult to subdivide along natural lines.

The descriptions and keys are based primarily on females, in which the specific characters are usually more pronounced. But males too are considered and take only a little more experience for accurate determinations. Males have shorter and more sloping temples, usually stronger mesoscutal sculpture, and usually the pale markings more restricted than in females. In some species there is a tendency for the mesoscutum of the males to be more polished than in females.

The lengths of the propleura of various species offer good characters, which are expressed in this paper as the length of the propleurum divided by the width of the mesoscutum. The length of the propleurum is measured from the truncation at the articulation of the front coxa to the apical flange just behind the head. These are the most practical extremes for measurement, though they are not at the true base and apex, and the resulting measurement does not give the true total length.

#### KEY TO THE NEARCTIC GENERA OF GASTERUPTIINAE

- Ovipositor sheath 0.35 to 0.5 as long as forewing; female subgenital plate with a median, apical, broadly V-shaped notch; upper anterior margin of pronotum with a forward-projecting tooth that is blunt, weak, or sometimes obsolete; propleurum of Nearctic species (measured from coxal articulation to apical flange) about 0.77 to 0.90 as long as mesoscutum is wide.... **Gasteruption**
- Ovipositor sheath 0.8 to 2.5 as long as forewing; female subgenital plate with a median, apical, narrow slit-shaped notch; upper anterior margin of pronotum with a forward-projecting tooth that is usually acute; propleurum of Nearctic species (measured from coxal articulation to apical flange) about 0.9 to 1.8 as long as the mesoscutum is wide..... **Rhydinofoenus**

## Genus GASTERUPTION Latreille

*Gasteruption* LATREILLE, Précis des caractères génériques des insectes disposés dans un ordre naturel, p. 113, 1796. Type: *Ichneumon assectator* Linnaeus; designated by Kieffer, 1903.

*Foenus* FABRICIUS, Entomologia systematica . . . , Suppl., pp. 210, 240, 1798. Type: *Ichneumon assectator* Linnaeus; designated by Curtis, 1832.

*Gastryptium* AGASSIZ, Nomenclator zoologicus, Index p. 160, 1846. Emendation of *Gasteruption* Latreille.

*Gasteryption* SEMENOW, Bull. Acad. Sci. St.-Petersbourg, new ser., vol. 3, p. 12, 1892. Emendation of *Gasteruption* Latreille.

*Gasteruption* SCHULZ, Spolia hymenopterologica, p. 133, 1906. Emendation of *Gasteruption* Latreille.

In addition to the differences pointed out in the key, this genus differs from *Rhydinofoenus* in having the antenna, thorax, abdomen, and legs somewhat shorter and in rarely having the hind tarsus marked with white. The short ovipositor, shallowly notched female subgenital plate, and blunt pronotal tooth are the recognition characters.

The genus is mostly Holarctic in distribution. I have seen also a species from the Philippines.

## KEY TO THE NEARCTIC SPECIES OF GASTERUPTION

1. Mesoscutum coarsely punctate or coarsely rugosopunctate; ovipositor sheath white at the apex; eye apparently bare (but with minute hairs).
  3. *amputatum*, new species  
Mesoscutum with moderately fine to very fine sculpture; ovipositor sheath uniformly dark; eye evidently hairy . . . . . 2
2. Frons and lateral lobe of mesoscutum weakly shining and with dense, fine, sharp punctures; second segment of hind tarsus about 2.2 as long as wide in male and about 1.6 as long as wide in female; fourth antennal segment about 2.0 as long as wide . . . . . 3
  - Frons and lateral lobe of mesoscutum mat and with scattered fine indistinct punctures; second segment of hind tarsus about 3.7 as long as wide in male and about 3.0 as long as wide in female; fourth antennal segment about 2.6 as long as wide . . . . . 4
3. Less than 0.6 of third and fourth tergites ferruginous. 1a. *kirbii kirbii* Westwood  
More than 0.6 of third and fourth tergites ferruginous.
  - 1b. *kirbii russeus*, new subspecies
4. Mesoscutum with a fine but rough appearing sculpture, and often with some medium-sized punctures; east of Rocky Mountains in Transition and Upper Austral zones . . . . . 2c. *assectator arca* Couper  
Mesoscutum with a very fine smooth sculpture, including some small indistinct punctures . . . . . 5
5. Thorax entirely or partly ferruginous, at least along sutures; Utah.
  - 2b. *assectator utahensis*, new subspecies
 Thorax entirely blackish; Pacific to Rocky Mountains, and in Canadian Zone east to Atlantic . . . . . 2a. *assectator assectator* Linnaeus

## 1. GASTERUPTION KIRBII (Westwood)

*Second segment of hind tarsus of male about 2.2 as long as deep, of female about 1.6 as long as deep.*

Forewing about 6.0 mm. long; as seen from above, the hind margin of head broadly and deeply concave; eye with moderately dense, very short pubescence; fourth antennal segment about 1.8 as long as wide in male and about 2.2 as long as wide in female; top of head subshining, with very close, sharp, fine punctures; propleurum about 0.83 as long as the mesoscutum is wide; mesoscutum smooth, subshining, with extremely close very fine punctures that except under higher magnifications appear as an even rather mat sculpture, and some indistinct irregular moderately small punctures; second segment of hind tarsus of male about 2.2 as long as deep, of female about 1.6 as long as deep; ovipositor sheath about 0.47 as long as the forewing.

Blackish. Flagellum tinged with brownish toward the apex; tegula, front and middle legs beyond coxae, hind tarsus, and under side of hind tibia light red-brown to blackish brown; abdomen blackish with the second to fifth segments partly to entirely ferruginous, according to the subspecies; ovipositor sheath entirely blackish.

This species is transcontinental in the Canadian Zone. There are two subspecies, differing in the amount of ferruginous on the abdomen.

1a. *GASTERUPTION KIRBII KIRBII* (Westwood)

*Foenus Kirbii* WESTWOOD, Trans. Ent. Soc. London, ser. 2, vol. 1, p. 219, 1851.

Type: ♀, Hudson Bay (London).

*Gasteruption kirbyi* HEDICKE, Hymenopterorum catalogus, pt. 11, p. 32, 1939. Emendation.

Female: Abdomen blackish, marked with ferruginous as follows: A small indistinct lateral area at apex of first tergite, apical  $0.4 \pm$  of second and third tergites, and a ferruginous tinge on the apical  $0.3 \pm$  of fourth tergite.

Male: Abdomen blackish, marked with ferruginous as follows: A small indistinct lateral area at apex of first tergite, apical  $0.35 \pm$  of second and third tergites, apical 0.25 of fourth tergite and apical 0.15 of fifth tergite.

*Specimens*.—3♂, 30♀, from BRITISH COLUMBIA (Fitzgerald, Robson, and Seton Lake at Lillooet); MICHIGAN (Cheboygan County and Marquette); NEW BRUNSWICK (Bathurst); NEW YORK (Catskills, Keene Valley in Essex County, and Mount Skylight in Essex County at 4,800 to 4,920 feet); NOVA SCOTIA (Baddeck); ONTARIO (Gold Rock in the Rainy River district, Kearney, Mattawa, Ottawa, Simcoe, and Sudbury); PRINCE EDWARD ISLAND (Brackley Beach in the Canadian National Park); QUEBEC (Aylmer, Fort Coulonge, and Kazubazua); and SASKATCHEWAN (Runciman and Waskesiu Lake). Dates of collection fall mostly from June 18 to July 29. Those outside this range are June 2 at Lillooet, British Columbia; June 8 at Kazubazua, Quebec; June 12 at Ottawa, Ontario; and August 13 in Keene Valley, Essex County, N. Y.

This subspecies occurs in the Canadian Zone of Canada and the eastern United States. In British Columbia it intergrades with *G. kirbii russeus* and is replaced in the Western United States by this subspecies.

**1b. GASTERUPTION KIRBII RUSSEUS, new subspecies**

Abdomen with more extensive ferruginous markings than in the typical subspecies, the second and third tergites being at least 60 percent ferruginous, and typically the abdomen from the second to the base of the sixth tergites almost entirely ferruginous. The subspecies is most distinct in California and Oregon, and intergrades with the typical subspecies at Robson, British Columbia. Specimens from Washington State and from Grand Teton National Park, Wyoming belong definitely to this subspecies but average less extensively ferruginous than California and Oregon specimens.

Type: ♀, Mammoth Lake, Mono County, Calif., July 23, 1936, R. M. Bohart (Townes).

Paratypes: 7 ♂, 37 ♀, from BRITISH COLUMBIA (Robson); CALIFORNIA (Giant Forest in Tulare County, Gold Lake in Sierra County, Huntington Lake in Fresno County at 7,000 feet, Mammoth, Meadow Valley in Plumas County at 4,000 to 5,000 feet, Strawberry Valley in El Dorado County, Summit in Placer County, Wood Creek in Fresno County at 8,000 feet, and Yosemite); COLORADO (Elk Creek near Fraser in Grand County and Longs Peak Inn at 9,000 feet); IDAHO (Bear Pass Creek in Butte County and Warren in Idaho County); OREGON (Aneroid Lake in the Blue Mountains at 7,500 feet, Corvallis, Grave Creek at Reuben Creek 20 miles north of Granite Pass, Lick Creek Ranger Station in the Wallowa National Park, Pine Creek Canyon in Baker County at 4,600 to 5,300 feet, Strawberry Camp in Grant County at 5,700 feet, Strawberry Lake in Grant County at 6,000 feet, and 22 miles southwest of St. Helena); WASHINGTON (Longmire Springs on Mount Rainier at 2,500 feet); and WYOMING (Grand Teton National Park). Dates of collection are from May 21 to August 15.

This subspecies occurs in the Canadian Zone of the United States from the Pacific to the Continental Divide, and in southern British Columbia, where it intergrades with *G. kirbii kirbii*.

**2. GASTERUPTION ASSECTATOR (Linnaeus)**

*Second segment of hind tarsus of male about 3.7 as long as deep, of female about 3.0 as long as deep; eye conspicuously pubescent.*

Forewing about 5.5 mm. long; as seen from above, the hind margin of head shallowly concave; eye with dense short pubescence, denser in the female than in the male; fourth antennal segment about 2.5 as long as wide in male and about 2.7 as long as wide in the female.

top of head quite mat, with scattered small indistinct punctures; propleurum about 0.88 as long as the mesoscutum is wide; sculpture of mesoscutum varying from fine, even, and mat without distinct punctures or wrinkles to mat with considerable wrinkling and small to medium-sized indistinct punctures; second segment of hind tarsus of male about 3.7 as long as deep, of female about 3.0 as long as deep; ovipositor sheath about 0.38 as long as the forewing.

Typical coloration: Blackish. Mouth parts, tegula, front and middle legs beyond coxa, and hind tarsus brown; front and middle tibiae with a more or less distinct basal external pale area; hind tibia with a more or less distinct subbasal internal pale area; apical  $0.3 \pm$  of second and third tergites ferruginous; apical  $0.25 \pm$  of fourth tergite more or less distinctly tinged with ferruginous; ovipositor sheath entirely blackish. Males may have the abdomen almost entirely blackish, and various subspecies or varieties have the abdomen more extensively ferruginous.

This species is Holarctic. It is quite variable. In the Nearctic Region there is a transcontinental northern form that is similar to the form of northern Europe and is considered typical *assectator*. This in the East intergrades with a form of the Transition and Upper Austral Zones with coarser thoracic sculpture and a tendency toward having dull ferruginous thoracic markings, and in the West it intergrades with a form of the Pacific States with more extensive ferruginous markings on the abdomen. In Utah there is a race with extensive pale ferruginous markings. The eastern form with coarser thoracic sculpture is treated as the subspecies *arca* and the Utah race as the subspecies *utahensis*. The form of the Pacific States with the abdomen extensively ferruginous merges so gradually with typical *assectator* that it is not treated under a separate subspecific name. If a subspecific name seems desirable, it should be called *nevadense* Kieffer. The variability and extensive intergradations of all these forms make any subdivision into subspecies more or less arbitrary and unsatisfactory. Yet it would be a mistake to lose sight of the diversity of the various populations. The subspecific arrangement below may prove helpful in dealing with the situation.

#### 2a. GASTERUPTION ASSECTOR ASSECTOR (Linnaeus)

*Ichneumon assectator* LINNAEUS, Systema naturae, ed. 10, p. 566, 1758. Type: ♀, Europe (Linnaean Society).

*Foenus montanus* CRESSON, Proc. Ent. Soc. Philadelphia, vol. 3, p. 133, 1864. Type: ♀, Colorado (Philadelphia). (New synonymy.)

*Foenus incertus* CRESSON, Proc. Ent. Soc. Philadelphia, vol. 3, p. 133, 1864. Type: ♀, Colorado (Philadelphia).

*Gasteruption Nevadense* KIEFFER, Invertebrata Pacifica, vol. 1, p. 41, 1904. Types: 3 ♂, 6 ♀, Ormsby County, Nev. (Ithaca).



Thoracic sculpture rather even and fine, the mesoscutum with a fine scabrous mat sculpture that shows no definite wrinkles or more than small indistinct punctures.

Abdomen varying from the coloration described as typical for the species to mostly ferruginous from the base of the second tergite to the apex of the fifth. The abdomen averages most extensively ferruginous in California specimens, averages progressively less ferruginous in Oregon and Washington, and intergrades with the darker transcontinental type in British Columbia.

*Specimens.*—Many males and females from ALASKA (Matanuska); ALBERTA (Banff, Czar, Edmonton, Gull Lake, High Prairie, Norquay Meadows near Banff at 5,000 to 6,000 feet, Wabamum, and Waterton); ARIZONA (Mount Lemon in the Santa Catalina Mountains at 7,800 feet); BRITISH COLUMBIA (Courtenay, Duncan, Kaslo, Likely, London Hill Mine near Bear Lake at 7,000 feet, and Salmon Arm); CALIFORNIA (Berkeley, Fallen Leaf Lake in El Dorado County, Giant Forest in Tulare County, Gold Lake in Sierra County, Huntington Lake in Fresno County at 7,000 feet, Keen Camp, Kings River Canyon in Fresno County, Lagunitas in Marin County, Lake City in Modoc County, Lassen Creek in Modoc County, Meadow Valley in Plumas County at 3,500 to 4,000 feet, Mineralking, Mount Herman in Santa Cruz County, Oakland, San Mateo County, Santa Clara County, Siskiyou County, Sobre Vista in Sonoma County, Strawberry Valley in El Dorado County, Wood Creek in Fresno County at 8,000 feet, and Yosemite Valley); COLORADO (Boulder County, Colorado Springs, Elk Creek near Fraser in Grand County, Florissant, Granite Peaks Camp near Bayfield at 9,000 feet, Halfway House at Pikes Peak, Longs Peak Inn, Steamboat Lodge, and summit of Gore Mountains near Toponas); IDAHO (Four Mile Camp at Priest Lake); MANITOBA (Aweme and Teulon); MICHIGAN (Montcalm County and Montmorency County); MONTANA (Belton and Logan Falls in Glacier National Park); NEW BRUNSWICK (Bathurst); NEW JERSEY (Ramsey); NEW MEXICO (Beulah); NEW YORK (Boston, Gowanda, Hamburg, and Sea Cliff); NOVA SCOTIA (Baddeck and Ottawa House at Parrsboro); ONTARIO (Kearney, Ottawa, Sand Lake, Smoky Falls on the Mattagami River, Sudbury, Trenton, and Vineland); OREGON (Corvallis, Eagle Ridge at Klamath Lake, Graves Creek at Reuben Creek 20 miles north of Granite Pass, Homestead Inn at Mount Hood, Lake Basin Trail at Wallowa Lake at 4,500 to 5,500 feet, Lick Creek Ranger Station in Wallowa National Forest, Llao Rock at Crater Lake at 7,400 to 8,025 feet, Pamela Lake at 3,000 feet on Mount Jefferson, Pine Creek Canyon in Baker County at 4,600 to 5,300 feet, Scappoose, and Summit Prairie); PRINCE EDWARD ISLAND (Dalvay House in the Canadian National Park); QUEBEC (Aylmer, Cascapedia River, Gracefield, Laniel, Lake Opasatika, Montreal, Norway Bay,

Pentecost, St. Annes, and Seven Islands); SASKATCHEWAN (Waskesiu Lake); TENNESSEE (The Chimneys in Great Smoky National Park); UTAH (Salt Lake City); VERMONT (Lake Willoughby and Rutland); WASHINGTON (Colfax, Fishtrap Lake, Liberty Lake, Pullman, San Juan Island, and Mount Rainier at 2,900 feet, at 4,700 feet, at Berkeley Park, and at Longmire); and WYOMING (Bridge Basin). Dates of collection are mostly between June 20 and August 10, but scattering records show that the species is on the wing in some localities from June 1 to August 29. The only records outside this range are April 30 at Oakland, Calif; May 12 at Sobre Vista, Sonoma County, Calif.; May 24 at Keen Camp, Calif.; "May" at Oakland and in Santa Clara County, Calif.; and "September" at Halfway House, Pikes Peak, Colo.

This subspecies is transcontinental in the Canadian Zone. In the East it intergrades freely with the subspecies *G. assectator arca* wherever there is mingling of the fauna of the Canadian Zone with that of the Transition Zone. Series of specimens from many such localities, especially in Ontario and Quebec, must be arbitrarily assigned to one of the two subspecies, or the individual specimens assigned according to their individual characters. In parts of Utah the present form is presumably replaced by the subspecies *G. assectator utahensis*.

2b. GASTERUPTION ASSECTOR UTAHENSIS, new subspecies

Structurally similar to *G. assectator assectator* but smaller, with the forewing averaging about 4.5 mm. long.

Extensively pale ferruginous, to mostly fuscous. The most extensively pale specimen is fuscous only as follows: Head except apical half of clypeus, scape, flagellum except on the apex and the basal two segments, most of propleurum and fore coxa, central median part of first tergite, median saddles on the third to sixth tergites and sternites that are progressively larger and darker toward the apical segments, most of the seventh and eighth segments, and ovipositor sheath. The upper half of the hind tibia is dark brown except on its basal 0.25. The most extensively fuscous specimen (a male) is paler only as follows: Apical 0.3 of clypeus, margins of pronotum, mesepimeron, apical  $0.35 \pm$  of first to sixth tergites, and basal 0.12 of second to sixth tergites light ferruginous; most of antenna below, mouth parts, tegula, fore and middle legs beyond coxae, hind tibia, and hind tarsus pale yellowish brown, the hind tibia darker above except on its basal 0.2; hind trochanters and femur light brown.

Type: ♀, Woodside, Utah, September 4, 1937, G. F. Knowlton and F. C. Harmston (Washington).

Paratypes: ♀, Emory County, Utah, August 10, 1921, Grace O. Wiley (Townes). 7 ♂, 1 ♀, Emory County, Utah, August 23, 1921, Grace O. Wiley (St. Paul and Townes).

## 2c. GASTERUPTION ASSECTATOR ARCA (Couper), new status

- Feonus* (!) *Arca* COUPER, Can. Ent., vol. 2, p. 110, 1870 (cocoon described also). Type, ♀, ?Ottawa, Ontario (lost).
- Gasteruption micrura* KIEFFER, Arkiv Zool., vol. 1, p. 556, 1904. Type: ♀, Illinois (Stockholm). (New synonymy.)
- Gasteruption micrura* var. *nigripectus* KIEFFER, Arkiv Zool., vol. 1, p. 556, 1904. Type: ♀, New Jersey (Stockholm). (New synonymy.)
- Gasteruption Bakeri* KIEFFER, Ann. Soc. Ent. France, vol. 79, p. 75, 1910. Type: ♀, Jeannette, Pa. (Claremont, Calif.). (New synonymy.)
- Trichofocnus canadensis* KIEFFER, Ann. Soc. Ent. France, vol. 79, p. 77, 1910. Type, ♀, Toronto, Ontario (Berlin). (New synonymy.)
- Gasteruption Bakeri* var. *aberrans* STRAND, Arch. Naturg., vol. 76A, pt. 6, p. 27, 1912. Lectotype: ♀, Montreal, Quebec (Ithaca); hereby selected. (New synonymy.)

Thorax more coarsely and strongly sculptured than in typical *assectator* and often somewhat more shining. The mesoscutum is scabrously mat, with some wrinkling and often with more or less distinct irregular punctures. The mesoscutal sculpture varies from almost like that of typical *assectator* to rather strongly wrinkled and punctate in some individuals from the Upper Austral Zone. Specimens appear to average a trifle smaller and more slender than do those of typical *assectator*.

Coloration like that described as typical for the species, or with the sides of the thorax more or less dull ferruginous.

*Specimens*.—Many males and females from CONNECTICUT (Colebrook and Ledyard); ILLINOIS (Chicago, Ottawa, and Urbana); IOWA (Sioux City); KANSAS (Lawrence), MAINE (Hancock, Hooper, Machias, Monmouth, Orono, Presque Isle, Rangeley, Saco, Southport, and South West Harbor); MARYLAND (Beltsville, Cabin John, and College Park); MASSACHUSETTS (Brookline, Holden, Holliston, Lexington, Milton, Needham, Petersham, and Southbridge), MICHIGAN (Agricultural College, Alcona County, Arenac County, Bay County, Branch County, Clare County, Delta County, Douglas Lake, Gladwin County, Gratiot County, Houghton County, Kalkaska County, Lansing, Luce County, Mason County, Midland County, Montcalm County, Oceana County, Ontonagon County, Ottawa County, Shiawassee County, and Tuscola County); MINNESOTA (Hastings); MISSOURI (Cadet); NEW HAMPSHIRE (Pelham); NEW JERSEY (Delaware Water Gap, Duttonville, Englewood, Fort Lee, Greenwood Lake, and Ramsey); NEW YORK (Bear Mountain, Bemus Point, Bethany, Buffalo, Cold Spring Harbor, Copake Falls, Danby, Ellis Hollow in Tompkins County, Flatbush, Fort Montgomery, Gloversville, Heart Lake in Essex County, Huntington, Ithaca, Keene Valley in Essex County, Labrador Lake in Courtland County, Lake George, Long Lake, Memphis, Millwood, Minetto, New Berlin, New Rochelle, New York City, North Baltimore, Oneonta, Onteora Mountain in Greene County, Oswego, Otsego Lake, Poughkeepsie,

Ringwood in Tompkins County, Rome, Sea Cliff, Staten Island, Stony Island, Syracuse, Taughannock Falls in Tompkins County, Utica, Vista, West Point, and Wilmington Notch in the Adirondack Mountains); NORTH CAROLINA (Black Mountains); NOVA SCOTIA (Cape Breton Island, Kings County, Ottawa House at Parrsboro, and Petite Rivière); OHIO (Cleveland, Columbus, Delaware County, Franklin County, Hinkley, Put in Bay, Woodside, and Wooster); ONTARIO (Bells Corner, Gold Rock in the Rainy River district, Jordan, Niagara Glen, Ottawa, Sudbury, and Toronto); PENNSYLVANIA (Carlisle Junction, Harrisburg, Heckton Mills, Highspire, Mount Holly Springs, Northeast, Pike County, and Spring Brook); QUEBEC (Aylmer, Brome, Covey Hill, Hemmingford, Joliette, Laniel, Montiguy, and St. Annes); RHODE ISLAND (Hopkington and Westerly); SOUTH DAKOTA (Big Stone City); VERMONT (Grand Isle, Manchester, Rutland, and Woodstock); VIRGINIA (Great Falls, Langley, Peaks of Otter, and Shenandoah National Park at 1,800 feet); and WISCONSIN (Milwaukee). Dates of capture are mostly from May 30 to September 10. Those outside of this range are: April 26 in Delaware County, Ohio; May 19 at Great Falls, Va., May 21 at Urbana, Ill.; May 28 at Syracuse, N. Y.; September 14 in Montcalm County, Mich.; and September 15 in Midland County, Mich. This is the only species of the subfamily with rearing records for North America, and these are meager. Two records indicate it as reared from hosts in *Carya glabra* and in climbing bittersweet, and F. DeGant reared it at Cleveland, Ohio, from a pemphredonid in a rose stem. The type of *Foenus arca* was reared from a cocoon found under bark.

This subspecies occurs from the Atlantic to the one-hundredth meridian, mostly in the Transition Zone. In the colder part of its range it intergrades freely with the subspecies *G. assectator assectator*.

### 3. GASTERUPTION AMPUTATUM, new species

*Mesoscutum coarsely rugosopunctate; ovipositor sheath tipped with white.*

Forewing about 5.5 mm. long; as seen from above, hind margin of head with a broad, rounded, V-shaped notch; eye apparently bare, but with a very short, fine pubescence that is not ordinarily visible; fourth antennal segment of male about 2.3 as long as wide, of female about 2.4 as long as wide; top of head subshining, with close, sharp, fine punctures; propleurum about 0.8 as long as the mesoscutum is wide; mesoscutum coarsely rugosopunctate and somewhat mat; second segment of hind tarsus of male about 3.1 as long as deep, of female about 2.5 as long as deep; ovipositor sheath about 0.38 as long as forewing.

Blackish. Mouth parts, tegula, and fore and middle legs beyond coxae medium to blackish brown; fore and middle tibiae usually with

an external basal pale area; hind tibia usually with a subbasal pale area; hind basitarsus of female usually with a subapical pale band; abdomen ferruginous from about the apical 0.4 of second tergite to the basal part of the sixth tergite, the third and fourth tergites with a narrow to broad fuscous saddle and the fifth tergite with a broad fuscous saddle; apical 0.12 of ovipositor sheath whitish.

Type: ♀, Banjo Bill Camp Ground, Oak Creek Canyon, Ariz., May 20, 1947, H. and M. Townes (Townes). Collected with the aid of a grant from the American Philosophical Society.

Paratypes: ♂, same data as the type (Townes). ♀, Flagstaff, Ariz., 7,000 feet, July 20, 1934, R. G. Schmieder (Townes). ♀, Creede, Colo., 8,844 feet, August 1914, S. J. Hunter (Lawrence).

### Genus RHYDINOFOENUS Bradley

*Rhydinofoenus* BRADLEY, Deutsche Ent. Zeitschr., 1909, p. 39. Type: *Rhydinofoenus kaweahensis* Bradley; original designation.

In addition to the differences pointed out in the key, this genus differs from *Gasteruption* in having the antenna, thorax, abdomen, and legs somewhat longer and the hind tarsus often marked with white. The long ovipositor, deep apical split in the female subgenital plate, and acute pronotal tooth are the recognition characters.

#### KEY TO THE NEARCTIC SPECIES OF RHYDINOFOENUS

1. First abscissa of subdiscoidal vein absent (fig. 15, *k*); mandible without a small dorsal preapical tooth..... 12. **kaweahensis** Bradley
- First abscissa of subdiscoidal vein present (fig. 15, *l*); mandible with a small dorsal preapical tooth..... 2
2. Occipital carina or flange weakly reflexed and divided from head by a broad groove so that division between head and occipital carina is not sharp and sculpture of head appears to invade basal part of carina; ovipositor sheath 0.8 to 2.5 as long as forewing, broadly or narrowly white at apex. (*R. septentrionalis* and *R. pattersonae* belong here, though they are somewhat intermediate in the character of the occipital carina; in them the ovipositor sheath is narrowly tipped with white and less than 1.7 as long as forewing.)... 3
- Occipital carina or flange sharply reflexed and divided from head by a sharp groove, entirely without sculpture; ovipositor sheath 1.7 to 2.3 as long as forewing, broadly white at apex..... 7
3. Top of head behind ocelli with some fine transverse wrinkling, which often invades base of occipital flange..... 4
- Top of head behind ocelli without distinct fine wrinkling, only with fine punctures..... 6
4. Head about 0.37 as wide at occipital carina as at eyes; outer side of fore and middle tibiae usually with an external white stripe from base to apex; ovipositor sheath about 2.3 as long as forewing, its tip broadly white.
  3. **striatus**, new species
- Head about 0.40 to 0.54 as wide at occipital carina as at eyes; outer side of fore and middle tibiae without a complete external white stripe; ovipositor sheath 0.8 to 1.6 as long as forewing, its tip narrowly white or whitish... 5

5. Coxae entirely black; ovipositor sheath about 0.9 as long as forewing; lateral lobe of mesoscutum with fine close punctures that are somewhat confluent with fine transverse wrinkles, also with some sparser larger punctures.
1. *septentrionalis* Schletterer
- Coxae partly or entirely ferruginous; ovipositor sheath about 1.55 as long as forewing; lateral lobe of mesoscutum with irregular fine and coarse punctures that are confluent with irregular or somewhat transverse wrinkling.
2. *pattersonae* Melander and Brues
6. Lateral lobe of mesoscutum with a few rather small punctures (in addition to the numerous very fine punctures), which are somewhat concentrated on mesal side; fore and middle tibiae with an external white stripe from base to apex.....4. *visaliae* Bradley
- Lateral lobe of mesoscutum with coarse punctures, which are rather evenly distributed and separated by about their diameter; fore and middle tibiae without a complete external white stripe from base to apex.
5. *nevadae* Bradley
7. Tegula light ferruginous; lateral lobe of mesoscutum often with some large strong punctures; pronotum 1.0 to 1.4 as long as width of mesoscutum.. 8
- Tegula piceous to black; lateral lobe of mesoscutum with rather weak medium to small sized punctures; pronotum 0.9 to 1.1 as long as width of the mesoscutum; fore and middle tibiae whitish or stramineous at base, the rest brown or ferruginous..... 13
8. Mesoscutum with a few small or medium sized punctures, or almost impunctate; pronotum about 1.3 as long as width of mesoscutum; southern California and Arizona.....9. *enodis*, new species
- Mesoscutum with coarse punctures; pronotum 1.0 to 1.25 as long as width of mesoscutum..... 9
9. Front and middle tibiae ferruginous, somewhat paler basally; pronotum with some rather coarse transverse wrinkles, about 1.2 as long as width of mesoscutum..... 10
- Front and middle tibiae with an external white stripe from base to apex, or white basally and apically with white areas elongate externally; pronotum without coarse transverse wrinkles..... 11
10. Thorax entirely black; wings subhyaline.
- 8a. *floridanus bradleyi*, new subspecies
- Thorax largely ferruginous; wings light brown; Florida and southeastern Georgia.....8b. *floridanus floridanus* Bradley
11. Propleurum about 1.2 as long as width of mesoscutum; head about 0.40 as wide at occipital carina as at eyes, between ocelli and occipital carina smooth and with very fine punctures; southern Arizona.
7. *turbinatus*, new species
- Propleurum about 1.05 as long as width of mesoscutum; head about 0.43 as wide at occipital carina as at eyes..... 12
12. Hind corner of pronotum (except in some males) and underside of scape (except in some females) ferruginous; Atlantic west to one-hundredth meridian.....6a. *tarsatorius tarsatorius* Say
- Hind corner of pronotum and under side of scape blackish; Kansas, Texas, and Arizona.....6b. *tarsatorius solaris*, new subspecies
13. Occipital carina a broad reflexed flange that is about 0.35 as wide as flagellum; median lobe of mesoscutum rather coarsely punctured and transversely wrinkled.....11. *occidentalis* Cresson
- Occipital carina a narrow reflexed flange that is about 0.12 as wide as flagellum; median lobe of mesoscutum rather finely punctured and transversely wrinkled..... 14

14. Third tergite of both sexes with only apical 0.4 or less ferruginous; second segment of hind tarsus of female more or less white; top of head with weak, fine, transverse wrinkles; Atlantic to Rocky Mountain region, also British Columbia..... 10a. *barnstoni barnstoni* Westwood

Third tergite of female (and often also of male) more than half ferruginous; second segment of hind tarsus blackish; top of head with strong, fine, transverse wrinkles; Pacific to Rocky Mountain region.

10b. *barnstoni perplexus* Cresson

1. *RHYDINOFOENUS SEPTENTRIONALIS* (Schletterer), new combination

*Gasteruption septentrionale* SCHLETTERER, ANN. NATURH. HOFMUS. WIEN, vol. 4, p. 480, 1890. Type: ♀, British Columbia (Vienna).

*Ovipositor sheath about 0.9 as long as forewing.*

Female: Forewing about 5.5 mm. long; top of head with fine punctures and rather strong transverse fine wrinkling; temple weakly convex; head about 0.43 as wide at the occipital carina as at the eyes; occipital carina separated from the head by a rounded groove, about 0.3 as wide as the flagellum, transversely striate basally and somewhat reflexed: propleurum (measured from the coxal articulation to the apical flange) about 1.05 as long as the width of the mesoscutum, with small close punctures and some irregular wrinkling; lateral lobe of mesoscutum polished, with fine close punctures that are somewhat confluent with fine transverse wrinkles, and also with some sparser larger punctures; ovipositor sheath about 0.9 as long as forewing.

Blackish. Mandible ferruginous to brown; tegula ferruginous to dark brown; legs beyond coxae brown to blackish, the fore and middle tibiae with or without paler apical and subbasal or basal external paler marks, and the hind tibia with a small indistinct internal subbasal whitish mark; abdomen ferruginous at the apex of the first tergite, on the apical  $0.35 \pm$  of second tergite, apical  $0.3 \pm$  of third tergite, and apical  $0.2 \pm$  of fourth tergite; apical  $0.1 \pm$  of ovipositor sheath whitish.

Male: Unknown.

*Specimens:* ♀, Waterton, Alberta, July 14, 1922, H. L. Seamans (Ottawa). ♀, Williams, Ariz., June 15, Barber and Schwarz (Washington). ♀, Kaslo, British Columbia, July 11, 1912, R. C. Osburn (Washington). ♀, Cimarron, Colo., September 14, 1917, R. C. Shannon (Ithaca). ♀, Antelope Mountain, Harney County, 6,500 feet, July 6, 1931, D. K. Frewing (Corvallis).

This species is widespread west of the Continental Divide but scarce in collections.

2. *RHYDINOFOENUS PATTERSONAE* (Melander and Brues), new combination

*Gasteruption pattersonae* MELANDER and BRUES, Biol. Bull., vol. 3, p. 35, 1902.

Type: ♀, San Jose, Calif. (Cambridge).

*Gasteruption pyrhosternum* KIEFFER, Invertebrata Pacifica, vol. 1, p. 41, 1904.

Types: 2 ♀, Stanford University, Calif. (Ithaca).

*Gasteruption rubrofasciatum* KIEFFER, *Invertebrata Pacifica*, vol. 1, p. 42, 1904.  
Types: 4 ♂, Stanford University, Calif. (Ithaca). (New synonymy.)

*Ovipositor sheath about 1.55 as long as the forewing, with only its apical 0.05 ± pale.*

Forewing about 6.0 mm. long; top of head with very close fine punctures and very fine, close, irregular, transverse wrinkling; temple weakly convex. Head about 0.47 as wide at occipital carina as at eyes; occipital carina separated from the head by a rounded groove, about 0.2 as wide as the flagellum, transversely striate basally and somewhat reflexed; propleurum about 1.1 as long as the width of the mesoscutum, irregularly rugosopunctate, more finely so basally and more coarsely apically; lateral lobe of mesoscutum mat, with irregular fine and coarse punctures that are confluent with irregular or somewhat transverse wrinkling; ovipositor sheath about 1.55 as long as the forewing.

Blackish. Clypeus except at its base and mouthparts brownish ferruginous; flagellum more or less stained with brownish ferruginous, darkest above, on the basal few flagellar segments, and on the apical segment; prothorax varying from ferruginous to blackish; tegula ferruginous; front and middle legs ferruginous, their tibiae with paler external and basal marks; hind leg ferruginous-brown, the coxa ferruginous basally and the trochanters and more or less of the apical part of the coxa more or less infuscate; hind tibia with a whitish subbasal band; abdomen varying from mostly blackish with the second to fifth incisures broadly ferruginous, to mostly ferruginous with the tergites a little infuscate dorsally (except at their bases and apices) and the apical few tergites largely infuscate. Occasional specimens have the head and body almost entirely ferruginous, and in some the ferruginous coloration is more restricted than indicated above. Ovipositor sheath blackish with the apical  $0.05 \pm$  ferruginous or dirty white.

*Specimens.*—5 ♂, 24 ♀, from CALIFORNIA (Berkeley, Convict Lake, Davis, Hospital Canyon, Livermore Mountains, Mesa Grande in Sonoma County, "Mokel Hill," Oroville, Pillsbury Lake in Lake County, Poway in San Diego County, Sobre Vista in Sonoma County, and Stanford University); IDAHO (Oakley); OREGON (Ontario and Prairie City at 3,520 feet); UTAH (Logan); and WASHINGTON (Wenatchee). Dates of collection are rather evenly distributed from April 24 to September 18.

This species occurs in the rather arid regions of the Pacific States, Idaho, and Utah.

### 3. RHYDINOFOENUS STRIATUS, new species

*Occipital carina very high, weakly reflexed, and its dorsal part with fine wrinkles basally.*



Forewing about 6.0 mm. long; top of head with very fine close punctures and strong transverse wrinkling; temple weakly convex; head about 0.37 as wide at the occipital carina as at the eyes; occipital carina not distinctly separated from the head which merges with it gradually, weakly reflexed, about 0.3 as wide as the flagellum, basally with strong striae which are longitudinal dorsally and oblique laterally; propleurum about 1.1 as long as the width of the mesoscutum, transversely rugosopunctate; lateral lobe of mesoscutum polished, with fine close punctures that are somewhat confluent with fine transverse wrinkles, also with some sparser larger punctures; ovipositor sheath about 2.3 as long as the forewing.

Blackish. Apical part of clypeus, mandible, and most of fore and middle legs beyond coxae ferruginous to dark brown; flagellum except basally often stained with ferruginous; tegula ferruginous to brownish ferruginous; fore and middle tibiae with a white external stripe from base to apex or sometimes this stripe reduced to basal and apical white marks; fore and middle tarsi partly white; hind tibia with a subbasal white mark; hind basitarsus of female usually marked with white or whitish; abdomen with a lateral spot at apex of first tergite, apical  $0.3 \pm$  of second and third tergites, apical  $0.2 \pm$  of fourth tergite, and apical  $0.12 \pm$  of fifth tergite ferruginous. Often, however, the abdominal ferruginous marks are more extensive and in females may occupy all but the basal and apical portions. Apical  $0.1 \pm$  of ovipositor sheath white.

Type: U. S. N. M. No. 58829, ♀, Santa Clara County, Calif., May (Washington).

Paratypes: 22 ♂, 18 ♀, from BRITISH COLUMBIA (Pavillion Lake); CALIFORNIA (Bishop, Fallen Leaf Lake in El Dorado County, Gold Lake in Sierra County, Jacumba, Lone Pine, Mammoth in Mono County, Middle West, Middleton in Lake County, Mount Bradley in Siskiyou County, Murphys in Calaveras County at 2,500 feet, Paradise Valley in Fresno County, San Francisco, Stanford University, Strawberry Valley in El Dorado County, Tapir Park, Westwood Hills in Los Angeles County, and Yosemite Valley); IDAHO (Coeur d'Alene); NEVADA (Carson City); OREGON (Corvallis, Lick Creek Ranger Station in Wallowa National Park, Lincoln Mountain at Weston, Little Camp Creek at 5,550 feet on Sheep Mountain in Grant County, Milton, and Mount Angel in Marion County); and WASHINGTON (Soba Spring). Dates of collection are rather evenly distributed from May 25 to August 15, and there is a record of October 3 at Jacumba, Calif.

This species occurs in British Columbia, the Pacific States, Idaho, and Nevada.

## 4. RHYDINOFOENUS VISALIAE (Bradley), new combination

*Foenus visaliae* BRADLEY, Deutsche Ent. Zeitschr., 1909, p. 40. Type: ♀, Claremont, Calif. (Ithaca).

*Occipital carina very high, weakly reflexed, not wrinkled basally; lateral lobe of mesoscutum with a few rather small punctures.*

Forewing about 5.5 mm. long; top of head with very fine close punctures and a suggestion of fine transverse wrinkling; temple nearly flat; head about 0.39 as wide at the occipital carina as at the eyes; occipital carina not distinctly separated from the head which merges with it gradually, weakly reflexed, about 0.25 as wide as the flagellum, basally with very fine punctures; propleurum about 1.4 as long as the width of the mesoscutum, with close fine punctures and more or less transversely or irregularly rugulose; lateral lobe of mesoscutum polished, or in the female more often mat, smooth, finely punctate or rugosopunctate and with some scattered larger punctures; ovipositor sheath about 2.4 as long as the forewing.

Blackish. Mandible, apical part of clypeus, and tegula ferruginous to brownish ferruginous; fore and middle legs ferruginous to dark brown, their tibiae with an external white stripe from base to apex, or this stripe sometimes reduced to basal and apical marks; fore and middle tarsi partly white; hind coxa sometimes more or less ferruginous; hind tibia with a conspicuous subbasal white mark; hind tarsus of female extensively marked with white, usually with the second, third, and most of the first segments white; hind tarsus of male sometimes marked with white; abdomen with the apical part of the second to fifth segments more or less ferruginous, more broadly and brightly so on the sides than above. Often the ground color itself of the second to about the sixth tergites is dusky ferruginous. An occasional female may have the mesepimeron and part of the pronotum ferruginous. Apical  $0.2 \pm$  of ovipositor sheath white.

*Specimens.*—♂, Patagonia, Ariz., July 1936, E. S. Ross (New York). ♂, Coffee Creek in Trinity County, Calif., June 19, 1934 (Bohart). ♂, on Compositae, Murphys, 2,500 feet, Calaveras County, Calif., September 8, 1937, F. E. Blaisdell (San Francisco). ♂, "Pom" [=? Pomona, Calif.] (Cambridge). ♂, Riverside, Calif., May 5, 1935, A. L. Melander (Cambridge). ♀, Riverside, Calif., May 23, 1936, C. Dammers (Washington). ♀, Sobre Vista, Sonoma County, Calif., July 10, 1913, J. A. Kuseche (Townes). ♂, 10 miles south of The Dalles, Oreg., June 15, 1938, Gray and Schuh (Corvallis). 2 ♂, ♀, on *Polygonum*, Brownsville, Tex., March 19, 1908, Jones and Pratt (Washington and Townes). ♂, Agua Verde, Baja California, Mexico, May 26, 1921, E. P. Van Duzee (Townes). ♂, Big Canyon, Sierra Laguna, Baja California, Mexico, October 13, 1941, Ross and Bohart (San Francisco). ♀, Guadalupe Point, Concepción Bay, Gulf of California, Mexico, June 17, 1921, E. P. Van Duzee (San Francisco).

2 ♀, Guaymas, Mexico, April 6 and 10, 1921, E. P. Van Duzee (San Francisco and Townes). ♂, Mesquital, Baja California, Mexico, July 28, 1938, Michelbacher and Ross (Townes). ♀, San Evaristo, Baja California, Mexico (San Francisco).

This seems primarily a Mexican species that occurs also in the adjacent United States and in the far west as far north as Oregon.

5. RHYDINOFOENUS NEVADAE (Bradley), new combination

*Foenus nevadae* BRADLEY, Trans. Amer. Ent. Soc., vol. 34, p. 114, 1908. Type: ♀, Nevada (Philadelphia).

*Occipital carina high, weakly reflexed, not wrinkled basally; lateral lobe of mesoscutum with a number of coarse punctures.*

Forewing about 6.0 mm. long; top of head with fine close punctures and a suggestion of fine transverse wrinkling; head about 0.39 as wide at occipital carina as at eyes; temple very weakly convex; occipital carina not distinctly separated from the head, which merges with it gradually, somewhat reflexed, about 0.25 as wide as the flagellum, basally with very fine punctures; propleurum about 1.05 as long as the mesoscutum is wide, with close fine punctures and more or less transversely or irregularly rugulose; lateral lobe of mesoscutum polished, with numerous fine punctures and interspersed coarse deep punctures that are separated by about their diameter; ovipositor sheath about 2.2 as long as the forewing.

Blackish. Mandible brownish ferruginous; flagellum somewhat stained with ferruginous, darkest basally; tegula ferruginous to brownish ferruginous; fore and middle legs ferruginous to brown, their coxae often darker than the rest and their tibiae whitish basally; hind legs brownish ferruginous to blackish, their tibiae with a paler, often whitish, band; hind tibia frequently blackish above and the rest ferruginous brown except for the subbasal pale band; hind basitarsus of female sometimes marked with whitish; abdomen largely ferruginous, more or less infuscate basally, apically, and above, and usually with some infuscation centrally on the second to fifth tergites. Apical  $0.2 \pm$  of ovipositor sheath whitish.

*Specimens*.—♂, Colfax, Calif., June 18, 1936, R. M. Bohart (Townes). ♀, El Portal, Calif., May 30, 1938, R. M. Bohart (Townes). ♂, Palm Springs, Calif., May 20, 1917, E. P. Van Duzee (Townes). ♀, Placerville, Calif., June 25, 1937, G. P. Engelhardt (San Francisco). ♂, Arroyo Seco Canyon, San Gabriel Mountains, Calif., July 6, 1912, J. C. Bridwell (Washington). ♀, Soboba Springs, Riverside County, Calif., June 5, 1917, E. P. Van Duzee (San Francisco). ♂, Sonoma County, Calif., June 26, 1919, J. A. Kusche (San Francisco). ♂, Strawberry Valley, El Dorado County, Calif., August 5, 1912, E. C. Van Dyke (San Francisco). 3 ♂, 3 ♀, Yerington, Lyon County,

Nev., June, July 5, July 21, and July 27, 1909 (Ithaca and Townes).  
 ♂, Mesilla Park, N. Mex., May 7, T. D. A. Cockerell (Washington).  
 Known from California, Nevada, and New Mexico.

6. *RHYDINOFOENUS TARSATORIUS* (Say), new combination

Figure 15, j

*Occipital carina sharply reflexed; tegula ferruginous; propleurum about 1.05 as long as width of mesoscutum; hind corner of pronotum often ferruginous.*

Forewing about 6.0 mm. long; top of head with fine close punctures and sometimes a suggestion of wrinkling; temple weakly convex; head about 0.43 as wide at the occipital carina as at the eyes; occipital carina separated from the head by a sharp groove, sharply reflexed, about 0.12 as wide as the flagellum, unsculptured; propleurum about 1.05 as long as the width of the mesoscutum, with close fine punctures and more or less transversely or irregularly rugulose; lateral lobe of mesoscutum polished, with numerous fine punctures and interspersed coarse deep punctures that are separated by about their diameter; ovipositor sheath about 2.1 as long as the forewing.

There are two subspecies, separable on color as indicated in the key and in the descriptions below.

6a. *RHYDINOFOENUS TARSATORIUS TARSATORIUS* (Say)

*Foenus tarsatorius* SAY, in Keating, Narrative of an expedition to the source of St. Peters River, vol. 2, p. 321, 1824; LeConte ed., vol. 1, p. 215. Type: ♀, Pennsylvania (destroyed).

*Gasteruption intricatum* KIEFFER, Arkiv Zool., vol. 1, p. 556, 1904. Type: ♀, New Jersey (Stockholm).

Blackish. Mandible ferruginous-brown; under side of scape and flagellum except basally stained with ferruginous-brown; hind corner of pronotum, including the part over the spiracle, brownish ferruginous, or in males more narrowly ferruginous and often entirely black; fore and middle legs beyond their coxae brown to ferruginous, their tibiae with an external white stripe from base to apex or the stripe interrupted medially; fore and middle tarsi partly white; hind tibia with a sub-basal whitish mark; hind tarsus of female rather extensively marked with white, usually with most of the first and second segments white; hind basitarsus of male usually marked with whitish; abdomen with about the apical 0.3 of second tergite, apical 0.2 of third tergite, and apical 0.12 of fourth tergite ferruginous; apical  $0.15 \pm$  of ovipositor sheath white. A female from McClellanville, S. C., has the head, thorax, and coxae entirely ferruginous and the abdomen more extensively ferruginous than described. It may represent a Lower Austral race.

This subspecies is readily distinguished from all other *Rhydinofoenus* in the Transition and Upper Austral zones of the East by the

ferruginous hind corner of the pronotum. This mark, however, is indistinct in many males. The extensive white on the outer side of the fore and middle tibiae is another character of value in distinguishing it from other *Rhydinofoenus* in its range.

*Specimens*.—Many males and females from CONNECTICUT (Colebrook, Ledyard, and Lyne); DISTRICT OF COLUMBIA (Rock Creek Park); INDIANA (Elkhart); IOWA (Sioux City); KENTUCKY (Green County); MAINE (Hooper); MARYLAND (Bowie, Glen Echo, Great Falls, Plummerville, and Takoma Park); MASSACHUSETTS (Dudley, Holliston, Petersham, Taunton, Ware, and Woods Hole); MICHIGAN (Alpena County, Kent County, and Osceola County); NEW YORK (Aurora, Bemus Point, Farmingdale, Fort Montgomery, Freeville, Greenwood Lake, Hancock, Horton, Huntington, Ithaca, Milford Center, Millwood, North Baltimore, Olcott, Oneonta, Shokan, Slaterville, and Stony Island); NORTH CAROLINA (Black Mountains); NEW HAMPSHIRE; NEW JERSEY (Delaware Water Gap, Moorestown, and Sussex); OHIO (Delaware County, Hinckley, Hocking County, Put in Bay, Ross County, Sandusky, and Shawnee Forest); ONTARIO (Bobcaygeon, Ottawa, Ridgeway, Stittsville, Strathroy, and Wainfleet); PENNSYLVANIA (Carlisle Junction, Chinchilla, Harrisburg, Hecton Mills, Highspire, Hummelstown, Inglenook, and Spring Brook); QUEBEC (Aylmer and Hull); SOUTH CAROLINA (McClellanville); TENNESSEE (Clarksville and The Chimneys in Great Smoky Mountains National Park); and VIRGINIA (Chesapeake Beach, Falls Church, Glencarlyn, Mount Vernon, Pimmit Run, and Rosslyn). Dates of collection are mostly in July and August, but there are many captures in June and early in September. The earliest collection date is June 3 at Takoma Park, Md., and latest September 18 at Chesapeake Beach, Va. A male from Harrisburg, Pa., was reared from "climbing bittersweet."

This subspecies occurs from the Atlantic west to about the one-hundredth meridian, mostly in the Transition Zone. A single specimen from the Lower Austral Zone (McClellanville, S. C.) has the head and thorax entirely ferruginous and probably represents a different subspecies. In the Southwest the present subspecies is replaced by *R. tarsatorius solaris*.

6b. *RHYDINOFOENUS TARSATORIUS SOLARIS*, new subspecies

Similar to *R. tarsatorius tarsatorius* except as follows: Under side of scape and hind corner of pronotum blackish; abdomen with its ferruginous markings averaging more extensive than in *tarsatorius tarsatorius*.

Type: ♂, Ajo, Ariz., April 9, 1947, H. and M. Townes (Townes).

Paratypes: 2♂, near Roosevelt Lake, Ariz., April 17 and 21, 1947, H. and M. Townes (Townes). ♂, Sahuarita, Ariz., April 11,

1947, H. and M. Townes (Townes). ♀, Huachuca Mountains, Ariz., July 8, 1932, J. D. Beamer (Townes). ♀, Douglas County, Kans., June 20, 1922, W. J. Brown (Lawrence). The specimens taken by the author were all flying around shrubs in Sonoran desert habitats. They were secured while on a collecting trip supported by a grant from the American Philosophical Society.

7. *RHYDINOFOENUS TURBINATUS*, new species

*Occipital carina sharply reflexed; tegula ferruginous; front and middle tibiae with an external white stripe; pronotum about 1.2 as long as width of mesoscutum.*

Forewing about 5.5 mm. long; top of head with very fine punctures, not at all wrinkled; temple short, almost flat; head about 0.40 as wide at the occipital carina as at the eyes; occipital flange separated from head by a sharp groove, sharply reflexed, about 0.12 as wide as the flagellum, unsculptured; propleurum about 1.2 as long as the width of the mesoscutum, irregularly finely punctatorugulose and medially with transverse or irregular rugosity; lateral lobe of mesoscutum polished, with numerous fine punctures and rather closely spaced coarse deep punctures; ovipositor sheath about 2.1 as long as the forewing.

Blackish. Apical part of clypeus, mandible, apical three segments of female flagellum, tegula, and abdominal markings brownish ferruginous; fore and middle legs shading from light brown apically to dark brown basally, their tarsi largely white and their tibiae white externally; hind tibia with a subbasal white mark; hind basitarsus with its apical  $0.7 \pm$  white; second to sixth abdominal segments brownish ferruginous with the basal  $0.65 \pm$  of the second and third tergites infusate; apical  $0.15 \pm$  of ovipositor sheath white.

Type: U. S. N. M. No. 58830, ♀, Post Creek Canyon, Pinaleno Mountains, near Fort Grant, Ariz., July 15 to 18, 1917 (Washington).

Paratypes: 2♀, same data as type (Cambridge and Townes). 2♂, Horseshoe Canyon, Chiricahua Mountains, Ariz., at 6,000 feet (Washington).

8. *RHYDINOFOENUS FLORIDANUS* (Bradley)

*Occipital carina sharply reflexed; tegula ferruginous; front and middle tibiae fulvous, whitish basally.*

Forewing about 6.0 mm. long; top of head with fine close punctures; temple rather weakly convex; head about 0.39 as wide at occipital carina as at eyes; occipital flange separated from the head by a sharp groove, sharply reflexed, about 0.12 as wide as the flagellum, unsculptured; propleurum about 1.2 as long as the width of the mesoscutum, with small weak punctures and medially with rather coarse

transverse wrinkles; lateral lobe of mesoscutum polished, with numerous fine punctures and interspersed coarse deep punctures that are separated by about their diameter; ovipositor sheath about 1.8 as long as the forewing.

There are two subspecies, separable on color as indicated in the key and in the descriptions below.

8a. *RHYDINOFOENUS FLORIDANUS BRADLEYI*, new subspecies

Blackish. Apical part of clypeus, mandible, tegula, front and middle legs, more or less of hind coxa, and abdominal markings fulvous; flagellum tinged with fulvous except basally; front and middle tibiae brownish fulvous, paler basally; hind coxa fulvous basally with more or less of its apical part blackish, or sometimes entirely blackish; hind tibia with a subbasal white mark; hind basitarsus of female usually marked with white; wings subhyaline; apical  $0.35 \pm$  of second and third tergites and apical  $0.2 \pm$  of fourth tergite fulvous; apical  $0.7 \pm$  of ovipositor sheath white.

Type: U. S. N. M. No. 58831, ♀, Put in Bay, Ohio, August 31, 1942, R. W. Strandtman (Washington).

Paratypes: 37 ♂, 103 ♀, from CONNECTICUT (Colebrook and South Meriden); DISTRICT OF COLUMBIA (Rock Creek Park); ILLINOIS (Ottawa); KANSAS (Lawrence); MAINE (Lincoln County); MARYLAND (Cabin John, Glen Echo, and Takoma Park); MASSACHUSETTS (Bourne, Forest Hills, Holden, Holliston, and Melrose Highlands); MICHIGAN (Detroit); MISSOURI (Clayton); MISSISSIPPI (Belzoni); NEW HAMPSHIRE (Durham); NEW JERSEY (Bear Swamp near Ramsey, Clementon, Greenwood Lake, Midvale, Moorestown, and Ramsey); NEW YORK (Bemus Point, Buffalo, Canajoharie, Ithaca, Lake George, Lockport, New York, North Baltimore, Nyack, Shokan, and Vista); OHIO (Cantwell Cliffs, Franklin County, Hocking County, Kelleys Island, Montgomery County, Ottawa County, Put in Bay, and Ross County); ONTARIO (Fort Erie, Jordan, and Niagara Glen); PENNSYLVANIA (Carlisle Junction, Charter Oak, Enola, Lehigh Gap, and Pike County); RHODE ISLAND (Westerly); TEXAS (Brownsville and Silver Lake at Chesham); and VIRGINIA (Chain Bridge near the District of Columbia, Dismal Swamp, East Falls Church, Falls Church, and Glencarlyn). Dates of collection are mostly in June, July, and August. Those outside these three months are as follows: March 19 at Brownsville, Tex.; May 20 at Cabin John, Md.; May 22 at Lawrence, Kans.; September 3 near Ramsey, N. J.; September 11 at Clementon, N. J.; October 18 at Buffalo, N. Y.; and October 22 at Brownsville, Tex.

This subspecies occurs from the Atlantic west to about the one-hundredth meridian in the Transition and Upper Austral Zones and occurs at Brownsville, Tex., which is a Lower Austral locality. It is

named in honor of Prof. J. C. Bradley in recognition of his pioneering revisionary work in this family.

8b. **RHYDINOFOENUS FLORIDANUS FLORIDANUS** (Bradley), new combination

*Foenus floridanus* BRADLEY, TRANS. AMER. ENT. SOC., vol. 34, p. 112, 1908. Type: ♀, Enterprize, Fla. (Philadelphia).

Colored as in *R. floridanus bradleyi* except that more or less of the thorax, all of the hind coxa, hind trochanters, the hind femur except apically, the first tergite, and the basal part of the second tergite are ferruginous. Also, the wings are light brown. In the subspecies *bradleyi* and in all other Nearctic members of the genus the wings are hyaline or subhyaline.

*Specimens*.—♂, Tifton, Ga. (Washington). ♀, Hibernia, Fla., August 7, 1939, R. H. Beamer (Lawrence).

9. **RHYDINOFOENUS ENODIS**, new species

*Occipital carina sharply reflexed, mesoscutum mat, its punctures weak and sparse, first abscissa of subdiscoidal vein present.*

Female: Forewing about 5.0 mm. long; top of head with very fine close punctures; temple weakly convex; head about 0.42 as wide at occipital carina as at eyes: occipital carina separated from the head by a sharp groove, sharply reflexed, about 0.12 as wide as the flagellum, unsculptured; propleurum about 1.3 as long as the width of the mesoscutum, mat and with close small punctures and some transverse wrinkling; lateral lobe of mesoscutum mat, with very sparse, moderately small, weak punctures and often with a little weak, fine, irregularly transverse wrinkling; ovipositor sheath about 1.8 as long as the forewing.

Blackish. Mandible, clypeus except basally, tegula, most of fore and middle legs, and abdominal markings fulvous; flagellum tinged with fulvous except basally; fore and middle tibiae white externally, their tarsi largely whitish; hind coxa fulvous, infusate apically; hind femur tinged with fulvous, its tibia with a white subbasal mark and its first two tarsal segments marked with white or entirely blackish; abdomen fulvous or dusky fulvous ventrally and laterally, except that the base and apex are entirely fuscous; apical  $0.3 \pm$  of second and third tergites fulvous; apical  $0.2 \pm$  of ovipositor sheath white. The paratype from Phoenix, Ariz., is smaller and darker than the two specimens from California. Its abdomen is fuscous with a tinge of fulvous laterally.

Type: ♀, Twentynine Palms, San Bernardino County, Calif., April 14, 1938, R. M. and G. E. Bohart (Townes).

Paratypes: ♀, Phoenix, Ariz., April 11, 1897, R. E. Kunze (Washington). ♀, Yuma, Ariz. or Calif., May 3 to 5, 1918, J. C. Bradley (Ithaca).



## 10. RHYDINOFOENUS BARNSTONI (Westwood), new combination

*Tegula piceous or black; occipital carina sharply reflexed, about 0.12 as high as width of flagellum.*

Forewing about 7.0 mm. long; top of head with fine close punctures and more or less distinct transverse wrinkling; temple moderately convex; head about 0.47 as wide at the occipital carina as at the eyes; occipital carina separated from head by a sharp groove, sharply reflexed, about 0.12 as wide as the flagellum, unsculptured; propleurum about 0.93 as long as the mesoscutum is wide, with small close punctures and postmedially punctatorugulose; lateral lobe of mesoscutum mat in female, usually polished in male, with weak, more or less irregular, rather small punctures and usually with weak transverse rugulosity; ovipositor sheath about 2.2 as long as forewing.

There are two subspecies distinguished on color and on the sculpture of the top of the head as indicated in the key and in the descriptions below.

## 10a. RHYDINOFOENUS BARNSTONI BARNSTONI (Westwood)

*Foenus Barnstoni* WESTWOOD, Trans. Ent. Soc. London, ser. 2, vol. 1, p. 220, 1851.

Type: ♀, Hudson Bay (London).

*Gasteruption pensile* SCHLETTERER, Ann. Naturh. Hofmus. Wien, vol. 4, p. 483, 1890. Type: ♀, Saskatchewan River, Canada (Geneva). (New synonymy.)

*Foenus cressoni* BRADLEY, Trans. Amer. Ent. Soc., vol. 34, p. 113, 1908. Type: ♀, Massachusetts (Philadelphia). (New synonymy.)

*Gasteruption Klagesi* KIEFFER, Ann. Soc. Ent. France, vol. 79, p. 75, 1910. Type: ♂, Jeannette, Pa. (Claremont, Calif.) (New synonymy.)

Fine transverse wrinkling of top of head usually rather weak.

Black. Mandible brown; tegula piceous to black; fore and middle legs piceous, beyond the middle of the femur lightening to brown, the bases of their tibiae paler; hind tibia whitish subbasally; hind tarsus of female with most of the first segment, all of the second segment, and usually also the third segment white; apical  $0.3 \pm$  of second and third tergites ferruginous; apical  $0.12 \pm$  of ovipositor sheath white.

*Specimens.*—Many males and females from ALASKA (Matanuska); ALBERTA (Beaverlodge, Czar, Edmonton, Greencourt, Tilley, Wabamun, and Wetaskiwin); CONNECTICUT (Colebrook, Litchfield, and Stamford); ILLINOIS (Ottawa); MAINE (Brooksville, Eustis, Greenville, Jackman, Orono, Rangeley, and South West Harbor); MANITOBA (Aweme and Berens River); MASSACHUSETTS (Holliston and Petersham); MICHIGAN (Alcona County, Alpena County, Baraga County, Gratiot County, Kent County, Menominee County, Midland County, and Oceana County); MINNESOTA (Hastings); NEW BRUNSWICK ("Barber D." and Bathurst); NEW HAMPSHIRE (Durham, Franconia, and base of Mount Washington); NEW YORK (Ava, Bemus Point, Boreas River in Essex County, Boston, Colden, East Aurora, Ellis Hollow in Tompkins County, Greene County at 2,500 feet,

Heart Lake in Essex County, Horton, Ithaca, Keene Valley in Essex County, McLean, Milford Center, Millwood, Ringwood in Tompkins County, Shokan, and Slaterville); NOVA SCOTIA (Cape Breton Island, Kentville, and Petite Rivière); OHIO (Columbus and Put in Bay); ONTARIO (Apple Hill, Jordan, Kearney, Niagara Glen, Norfolk, Orillia, Ottawa, Ridgeway, Simcoe, Smoky Falls on the Mattagami River, and Trenton); PENNSYLVANIA (North East); PRINCE EDWARD ISLAND (Brackley Beach and Dalvay House, both in the Canadian National Park, and Hampton); QUEBEC (Aylmer, Brome, Hemmingford, Lake Opasatika, Lanoraie, Laniel, Meach Brook Cascades, Norway Bay, St. Annes, Ste. Agatha des Montes, and Sweetsburg); SASKATCHEWAN (Earl Grey); VERMONT (Rutland); and WEST VIRGINIA (Bolivar). Collections dates are concentrated in the period from June 20 to August 10, but many others show the normal flight range to be from about June 5 to August 29. There is a single September record: September 22 at Bolivar, W. Va. Many specimens from western Canada are somewhat intermediate to the subspecies *R. barnstoni perplexus*, and one or more specimens from the following localities could as well be assigned to either subspecies: Sudbury, Ontario; Waskesiu Lake, Saskatchewan; Grimshaw, Alberta; Likely, British Columbia; and Rolla, British Columbia.

This subspecies is transcontinental in the Canadian and in the cooler parts of the Transition Zone. In the Western United States it is replaced by *R. barnstoni perplexus*, with which it intergrades in western Canada.

10b. *RHYDINOFOENUS BARNSTONI PERPLEXUS* (Cresson), new status, new combination

*Foenus perplexus* CRESSON, Proc. Ent. Soc. Philadelphia, vol. 3, p. 131, 1864.

Type: ♀, Colorado (Philadelphia).

*Foenis fragilis* BRADLEY, Trans. Amer. Ent. Soc., vol. 34, p. 111, 1908. Type: ♀, Montana (Philadelphia). (New synonymy.)

*Gasteruption alticola* KIEFFER, Ann. Soc. Ent. France, vol. 79, p. 76, 1910. Type: ♀, Ouray, Colo., 8,000 feet (Claremont, Calif.). (New synonymy.)

Fine transverse wrinkling of top of head usually rather strong.

Colored as in *R. barnstoni barnstoni* except that the female has less white on the hind tarsus and more ferruginous on the abdomen as stated in the key. Typical females have the second and third tergites almost entirely ferruginous and the hind tarsus entirely blackish or with 0.5 or less of the basitarsus white. Sometimes, especially in the southern part of the range of the subspecies, the fourth tergite also is partly or entirely ferruginous. Males have the abdominal ferruginous markings averaging larger than in *R. barnstoni barnstoni*, but the difference in extent is usually minor or indistinct and frequently not enough for safe use in making determinations.

This subspecies has a close superficial resemblance to *R. occidentalis* but is easily distinguished by its narrow occipital carina.

*Specimens*.—Many males and females from ALBERTA (Banff, Medicine Hat, Nordegg, Radnor, and Waterton); ARIZONA (Flagstaff at 7,000 feet and Mount Lemon in the Santa Catalina Mountains at 7,800 and at 9,150 feet); BRITISH COLUMBIA (Atlin, Likely, Nelson, Revelstoke, Robson, Rolla, Salmon Arm, and Seton Lake near Lillooet); CALIFORNIA (Alexander Valley in Sonoma County, Berkeley, Giant Forest at 6,400 to 7,000 feet, Gold Lake in Sierra County, Huntington Lake in Fresno County at 7,000 feet, Los Gatos, Meadow Valley in Plumas County at 4,000 to 5,000 feet, Mineralking, Santa Cruz, Strawberry Valley in El Dorado County, and Wood Creek in Fresno County at 8,000 feet); COLORADO (Boulder, Harry Creek at Marshall Pass at 9,000 to 10,850 feet, and Manitou); IDAHO (Bear Pass Creek in Butte County and Four Mile Camp at Priest Lake); MONTANA (Lake Roman in Lake County, Swift Current in Glacier National Park, and Whitefish); NEW MEXICO (Beulah at 8,000 feet and Rio Ruidoso in the White Mountains at 6,500 feet); NORTHWEST TERRITORIES (Fort Wrigley on the Mackenzie River); ONTARIO (Sudbury); OREGON (Baker at 3,400 feet, Corvallis, Lick Creek Ranger Station in the Wallowa National Park at 4,600 feet, Ontario, Pamela Lake on Mount Jefferson at about 3,000 feet, Pine Creek Canyon in Baker County at 4,600 to 5,300 feet, Queen Mine above Cornucopia at 5,000 feet, Sheep Mountain Lookout in Grant County at 7,500 feet, 8 miles northwest of Sisters, and Wilton); SASKATCHEWAN (Earl Grey and Waskesiu Lake); UTAH (Beaver Range Mountains at 8,000 to 10,000 feet, Logan, Park City, and Timpanogoa Mountain); WASHINGTON (Palouse Mountains in Whitman County and Mount Rainier at 2,500 and 2,900 feet); and WYOMING (Bridge Basin and Yellowstone National Park). Most dates of capture of this species are during June, July, and August. There are a number of others in May and one each in April (April 28) and September (September 5).

This species is common in the Canadian Zone of the United States from the Pacific to the Rocky Mountains. It is present and intergrades with *R. barnstoni barnstoni* in western Canada.

#### 11. RHYDINOENUS OCCIDENTALIS (Cresson), new combination

*Foenus occidentalis* CRESSON, Proc. Ent. Soc. Philadelphia, vol. 3, p. 131, 1864.  
Type: ♀, Colorado (Philadelphia).

*Gasteruption egregium* SCHLETTERER, Ann. Naturh. Hofmus. Wien, vol. 4, p. 486, 1890. Type: ♀, Rocky Mountains (Geneva). (New synonymy.)

*Tegula piceous* or black; occipital carina sharply reflexed, about 0.35 as high as width of flagellum.

Forewing about 8.0 mm. long; top of head with very fine punctures that are more distant than usual and with more or less distinct fine transverse wrinkling; temple moderately convex; head about 0.40

as wide at occipital carina as at eyes; occipital carina separated from head by a sharp groove, sharply reflexed, about 0.35 as wide as the flagellum, unsculptured; propleurum about 1.0 as long as the mesoscutum is wide, with small, weak separated punctures and apically rugose; lateral lobe of mesoscutum polished or mat, with moderately close medium-sized punctures and more or less distinct transverse rugosity; ovipositor sheath about 2.2 as long as the forewing.

Black. Tegula piceous to black; fore and middle legs with their tibiae, tarsi, and apices of their femora usually brownish, the tibiae with a subbasal or basal whitish mark; hind basitarsus of female marked with white. Abdomen varying in color from black with only the second and third tergites partly ferruginous to ferruginous with only the first and the apical tergites black. The more extensive ferruginous markings are more common in females than in males. Apical  $0.12 \pm$  of ovipositor sheath white.

This species is very close to the European *R. jaculator* (Linnaeus, 1758). It differs in having the temples a little longer and more weakly convex, the occipital carina not quite so high, and the fine wrinkling of the top of the head weaker. It may eventually prove to be only subspecifically distinct.

*Specimens*.—14 ♂, 36 ♀, from ARIZONA (Oak Creek Canyon and Parker Creek in the Sierra Ancha); BRITISH COLUMBIA (Robson and Wellington); CALIFORNIA (Agnew Meadows in Madera County, Carrville in Trinity County, Convict Lake, Dark Creek in the San Jacinto Mountains, Forest Home in the San Bernardino Mountains, Glen Blair in Mendocino County, Gold Lake in Sierra County, Guerneville in Sonoma County, Meadow Valley in Plumas County at 5,000 to 6,000 feet, Mount Diablo, Mountain Home Canyon in San Bernardino County, Murphys in Calaveras County at 2,500 feet, Piñon Flat in the San Jacinto Mountains, Placerville, Richardson Spring in Butte County, Siskiyou County, Sobre Vista in Sonoma County at 2,500 feet, Wood Creek at 8,000 feet, and Yosemite Valley); MONTANA (Lake Roman in Lake County); NEVADA (Carson City); OREGON (Corvallis, Fall Mountain Lookout Trail in Grant County at 5,200 to 6,000 feet, Grave Creek at Reuben Creek 20 miles north of Granite Pass, Horse Lake in the high Cascade Mountains of Lane County, Kane Creek 5 miles west of Gold Hill at 2,000 feet, Klamath Falls at 4,175 feet, Lick Creek Ranger Station in the Wallowa National Park, Milton, Modoc Point in Klamath County, Portland, Sparkes Lake at 5,428 feet in Deschutes County, and 20 miles west of St. Helena); and UTAH ("Fks" Logan Canyon). Dates of collection are mostly from May 12 to August 15. Those outside this range are: April 21 at Mount Diablo, Calif.; May 2 at Parker Creek, Sierra Ancha, Ariz.; and August 23 at Lake Roman, Lake County, Mont.

This species occurs in British Columbia and in the United States from the Pacific to Montana, Utah, and Arizona. Most locality records are in the Transition Zone.

12. *RHYDINOFOENUS KAWEAHENSIS* Bradley

FIGURE 15, *k*

*Rhydinofoenus kaweahensis* BRADLEY, Deutsche Ent. Zeitschr., 1909, p. 39. Type: ♀, Kaweah River, Tulare County, Calif. (Ithaca).

*First abscissa of subdiscoidal vein absent; pronotum more or less ferruginous.*

Forewing about 5.0 mm. long, lacking the first abscissa of the subdiscoidal vein (fig. 15, *k*, this vein present in all other Nearctic species); mandible without the usual small preapical tooth (this tooth present in all other Nearctic species); top of head with very fine, close punctures; temple nearly flat; head about 0.38 as wide at occipital carina as at eyes; occipital carina separated from head by a sharp groove, sharply reflexed, about 0.12 as wide as the flagellum, unsculptured; propleurum about 1.6 as long as the width of the mesoscutum, mat and with close very fine punctures and some transverse wrinkling; lateral lobe of mesoscutum of female mat and with weak fine punctures, medially rugose; lateral lobe of mesoscutum of male polished, or subpolished and finely rugosopunctate; ovipositor sheath about 1.4 as long as forewing.

Blackish. Mandible and tegula fulvous; apical edge of clypeus, all or much of pronotum, and a little to most of mesopleurum, meta-pleurum, and propodeum brownish ferruginous; legs brown to blackish, the hind coxa often ferruginous basally and the hind tibia with a whitish subbasal band; apical  $0.12 \pm$  of second to fifth tergites tinged with ferruginous; apical  $0.2 \pm$  of ovipositor sheath white.

*Specimens.*—♀, Los Angeles County, Calif. (Washington). ♂, Redlands, Calif., F. R. Cole (Washington). ♂, Turlock, Calif., April 9, 1936, G. E. and R. M. Bohart (Bohart). ♀, Opelousas, La., June 15, 1897, G. R. Pilate (Washington). ♂, Richmond, Tex., March 10, 1907, R. A. Cushman (Washington). ♂, Willis, Tex., 1903, J. C. Bridwell (Washington). ♂, ♀, San Rafael Jicoltepec, Mexico (Washington).